FARM KNOWLEDGE

FARM MANAGEMENT

FARM KNOWLEDGE

BUSINESS and home life on the farm are one and inseparable. This makes farming different from every other business, and the farm home different from every other home in the world. Has any farm family ever realized all it has to be thankful for—in its opportunity to get the best and the most out of living without going beyond the boundaries of its own home?

FARM KNOWLEDGE

A Com... ete Manual ...
ten by Recognized ...
of the Country; ...
...iples and the ...
Real Farm...
O... n C...

E. L. D. SE...

IN FO... R ...

VOLUME IV. ...

Farming as a Business; ... The Farm Family and The Farm Comm...; ... ple Terms; Farming Fac...

PREPARED E... FOR
SEARS, ROEBUCK AND CO.
BY
DOUBLEDAY, PAGE & COMPANY
GARDEN CITY ... YORK

BUSINESS and home life on the farm are one and inseparable. This makes farming different from every other business, and the farm home different from every other home in the world. Has any farm family ever realized all it has to be thankful for—in its opportunity to get the best and the most out of living without going beyond the boundaries of its own home?

FARM KNOWLEDGE

A Complete Manual of Successful Farming Written by Recognized Authorities in All Parts of the Country; Based on Sound Principles and the Actual Experience of Real Farmers—"The Farmer's Own Cyclopedia"

EDITED BY
E. L. D. SEYMOUR, B. S. A.

IN FOUR VOLUMES

VOLUME IV. FARM LIFE

Farming as a Business; The Farm Home, The Farm Family and The Farm Community; Farm Science in Simple Terms; Farming Facts, Figures and Opportunities

PREPARED EXCLUSIVELY FOR
SEARS, ROEBUCK AND CO.
BY
DOUBLEDAY, PAGE & COMPANY
GARDEN CITY NEW YORK

Revised Edition, 1919

FARM KNOWLEDGE

VOLUME IV. FARM LIFE

CONTENTS

CONTENTS

FULL PAGE ILLUSTRATIONS

(*See page 547 for index of text illustrations*)

Acknowledgments

THE Editor wishes to acknowledge with sincere appreciation the hearty, generous support and coöperation that have been afforded him throughout the course of his work, and to which will be due in very large measure whatever success FARM KNOWLEDGE may attain. It is, unfortunately, impossible for him to mention by name all the individuals, organizations, and other agencies that have so readily responded to appeals for advice, suggestions, criticism or other forms of assistance—which often have been the valuable result of years of investigation or practical experience.

He wishes, however, to thank especially those who have been associated with him in the actual building of the books. In connection with editorial matters these include Messrs. J. H. H. Alexander, F. H. Valentine, William L. Nelson, Albert Porter, C. O. S. Mawson, and Leonard Barron; in connection with the preparation of the illustration material, they include Messrs. B. F. Williamson, Howard L. Hastings and his associates, Eugene J. Hall, and the U. S. Department of Agriculture; in connection with the various manufacturing processes that attend the making of every book, they include all who have carried out, or enabled the Editor to carry out, the details upon which the successful development of the entire plan of the enterprise has so largely depended.

AUTHORS OF VOLUME IV

A List of the Men and Women Who Have Written This Volume, Together With the Subjects on Which They Have Written, and the Pages on Which Their Contributions Appear

PAGE

EUNICE BURTON ARMSTRONG, B.A. (Mt. Holyoke). M. A. (Columbia), and holder of diploma from the New York School of Philanthropy. A student of community and individual health and hygiene problems, many of which are being studied and solved by her husband who is director of the Community Health and Tuberculosis Demonstration, Framingham, Mass. Formerly student of conditions in Europe; factory inspector, N. Y. State Children's Bureau; Manager, Jacob Riis settlement house, New York City; chairman of social service of the Staten Island Federation of Welfare Agencies. Author of prize pamphlet on Sex Hygiene for Children.

BAB BELL, B.S., educator and student of home economics. Graduate of the University of Missouri; organizer of the Department of Economics in the Hannibal High School, Missouri, and teacher there for two years; institute lecturer with the Missouri State Board of Agriculture, 1913–1915; in charge of Home Economics extension work of the Missouri State College of Agriculture, 1915–1918.

OSCAR HERMAN BENSON, Agriculturist, in charge of Boys' and Girls' Extension Work and Home Economics, U. S. Department of Agriculture, Formerly (1905–1911) Superintendent of Schools in Wright County, Iowa. Has lectured extensively to Chautauqua assemblies and farmers' institutes. Joint author of "Agriculture" and "Agriculture for Farm and Fireside," and author of numerous pamphlets on boys' and girls' club work.

ANDREW BOSS, Professor and Chief of the Division of Agronomy and Farm Management in the College of Agriculture of the University of Minnesota, and vice-director of the State Agricultural Experiment Station. Since 1912 has had charge of the livestock, crops, and farm-management work, having been successively foreman, assistant and professor.

(*Continued*)

(*Continued*)

PAGE

EUGENE DAVENPORT, M. Agr., LL.D., Dean of the College of Agriculture, Director of the Experiment Station, and Professor of Thremmatology (the science of breeding animals and plants under domestication) in the University of Illinois. Formerly Professor of Practical Agriculture in the Michigan Agricultural College; and President of the Colegio Agronomica, São Paulo, Brazil. Author of "Principles of Breeding"; "Domesticated Animals and Plants"; and many papers, articles and bulletins.

ELLA VICTORIA DOBBS, Assistant Professor of Manual Arts, University of Missouri; Chairman of National Council of Primary Education. Formerly, teacher in rural-schools in Nebraska, Illinois, Utah, and California; Supervisor of Cardboard Construction in Los Angeles (Cal.) public schools; in charge of elementary handwork at Throop Polytechnic Institute, Pasadena, California; and Supervisor of Manual Arts in Helena, Montana. Graduate of Columbia University; Vice-president of Missouri Congress of Mothers and Parent-Teacher associations; author of "Primary Handwork" and "Illustrative Handwork."

JOHN MARCUS EVVARD, M.S., Professor and Assistant Chief in Animal Husbandry, Iowa State College; Chief in Swine Production, Iowa Experiment Station; Member, U. S. Livestock Industry Committee; Chairman Swine Commission, U. S. Food Administration; Member, Advisory Committee of Food Administration in charge of Meat and Packing Regulations. Formerly, Assistant to the Dean and Director of the Missouri Agricultural College and Experiment Station; Contributing Editor to the *National Swine Magazine*. Fellow of the Iowa Academy of Science; Member, American Association for the Advancement of Science; American Genetic Association, U. S. Livestock Sanitary Association; American Chemical Society; Vice-President, American Society of Animal Production. Author of numerous bulletins and articles in the farm press.

MRS. NELLIE E. FEALY, of the Bureau of Plant Industry, U. S. Department of Agriculture. Author of a monograph on organization in the United States for dealing with plant diseases and insect pests, prepared for the International Institute of Agriculture. Actively interested in practical fruit growing.

ELMER O. FIPPIN, B.SC., Director, Agricultural Bureau of the Lime Association; for 6 years Extension Professor of Soil Technology, New York State College of Agriculture at Cornell University; joint author of "Principles of Soil Management," "Soils, Their Properties and Management," etc. Born and reared on an Ohio farm, and a graduate of the College of Agriculture of that State. Formerly connected with the U. S. Department of Agriculture in soil-survey work in Maryland, Michigan, Iowa, Illinois, Missouri, Florida, Georgia, Connecticut, Massachusetts, New York and North Dakota.

(*Continued*)

(Continued)

PAGE

WILLIAM L. NELSON, practical farmer, agricultural writer and U. S. Congressman from Missouri. Formerly, for 10 years, Assistant Secretary of the Missouri State Board of Agriculture; also member of the Missouri Legislature; and Director of Agricultural Extension Work, University of Missouri.

A. W. NOLAN, M.S., State Supervisor of Agricultural Education for Illinois. Graduate of Indiana University; taught for several years in various schools; successively Professor of Horticulture, in the West Virginia Agricultural College; of Agricultural Extension in the University of Illinois; and of Agricultural Education in the University of Chicago. Author of textbooks on agriculture and teaching.

MRS. GROVER PEYTON, Paris, Missouri, practical farm woman of the Corn Belt. One of the organizers of the North Side Agricultural Class, a good example of an effective and successful farm neighborhood development.

FRED. H. RANKIN, Superintendent of Agricultural Extension and Assistant Dean of the College of Agriculture of the University of Illinois. A graduate of Illinois College, Jacksonville, Ill.; for 15 years owned and operated a grain and livestock farm in central Illinois; was secretary of the Jury of Awards, Universal Exposition, St. Louis, 1904; has been active as institute lecturer and as contributor to the press on agricultural subjects.

S. E. RASOR, Professor of Mathematics in Ohio State University. Taught for several years in various high schools and colleges, and has always been, either as farm owner or farm operator, in close contact with farm life and its problems.

MARY ELIZABETH ROBINSON, B.S. in Home Economics, Instructor in Extension Work in the College of Agriculture of the University of Missouri. Formerly taught Home Economics in the Warrensburg (Mo.) State Normal School. Has lectured and demonstrated extensively before farm women.

RODMAN SCHAFF, Fitzwilliam, New Hampshire, practical farmer. Except for a few years following his graduation from Princeton University, he has spent all his life on the farm.

(*Continued*)

FARM KNOWLEDGE

FARM KNOWLEDGE

VOLUME IV—PART I

The Business of Farming

IT has been said by one of America's greatest agricultural authorities and educators, that

> The requirements of a good farmer are at least four: The ability to make a full and comfortable living from the land; to rear a family carefully and well; to be of good service to the community; to leave the farm more productive than it was when he took it.

This is a far different understanding than that of the many people who think of farming as a simple, threefold method of accepting the bounty of Nature. Such people believe that all the farmer need do is to loosen the soil and sow seed, give the growing plants a little cultivation and protection, and gather in the harvest; or, in the case of livestock farming, they see only the young animal as an instance of the world's natural increase, a little feeding and care, and a final slaughtering, or securing of milk or other product. It is from such directions as this that we hear surprised voices asking why *anyone* of ordinary intelligence cannot soon succeed on the farm! It is possible, and indeed more than probable, that among farmers themselves there are a good many who, though realizing the lack of grounds for such a query, are, nevertheless almost as far from a clear-sighted, comprehensive view of the situation such as that just quoted.

It is the purpose of this volume to introduce and take up in some detail the factors, the surrounding conditions, and the basic principles upon which depends the possibility of a man's meeting the requirements as set down above. The subjects have been grouped under four main heads, the first two being closely and logically related; the others, though of equal importance, being less definitely associated with any particular phase of farming. The groups discuss respectively, the business of farming; the farm home, family and community; the elements of those sciences upon which farming is founded; and the agricultural conditions and opportunities in the various states of the Union. Their scope and purpose are discussed each in its individual introductory note.

The chapters in Part I are designed rather to stimulate thought, study, and the formulation of future plans, than to give actual directions for performing the several physical practices which, to some minds, constitute the whole farming enterprise. Thus, the problems of planning the system according to which the farm shall be run, and of keeping records of what has been and is to be done, are of immeasurable importance, even though they do not include, but only take note of, each day's labor. Thus, too, the question of what the farmer

can do with his money, what it means and where and how it is distributed among men, does not touch the problem of how to get that money from the land. The principles of marketing—one of the greatest stumblingblocks in the path of profitable farming—begin, in the main, where the raising of crops and animals stops. The relations between owner and tenant, employer and employee, proprietor and manager involve a few knotty points, but not enough to warrant the almost universal tendency to leave them undiscussed and but partially—if at all—understood. Each of these subjects is treated, therefore, with a view to supplying the sort of data and general information that is all too scarce. Another chapter deals with coöperation, the means by which, and the road along which, several farmers can work together for the benefit of all, collectively and singly. The relations between the farmer and the law—that is, its nature, its purpose, and its enforcement—are, like the subject of farm ownership, etc., just mentioned, all too often and too widely misunderstood or completely overlooked. Rural economics is an even more abstract subject, and one, to many minds, as unfamiliar as it is unattractive. Yet it represents and deals with farming as one of the world's industries in all its vital importance. No farmer can completely shut himself off from the outside world as in the past he may have chosen or been forced to do; as farming has come to have a wide and significant influence on national and world affairs, so it is affected by each of the other lines of effort or interest that play parts in the cycle of production, transportation, and consumption. Lastly, there is the neighborhood, the result of the inherent social instinct in men, whereby they are led to gather together for the betterment of themselves, their families, their business, and their environment. Though apparently apart from any possible phase of practical farming, this subject is of the greatest importance, since the success of each farm makes for a better neighborhood of which it is a part, while every advance of a neighborhood is reflected in each of the farms that compose it.

It is in these ways that the farmer becomes a factor in the life that extends beyond his immediate, local interests; and it is only by broadening himself to meet the responsibilities and requirements of this rôle that he makes the most of himself and of his opportunities.—EDITOR.

THE FARMER'S CREED

I believe that soil likes to eat as well as its owner, and ought, therefore, to be liberally fed.

I believe in large crops which leave the land better than they found it—making the farmer and the farm both glad at once.

I believe in going to the bottom of things and, therefore, in deep plowing and enough of it. All the better with a subsoil plow.

I believe that every farm should own a good farmer.

I believe that the best fertilizer for any soil is a spirit of industry, enterprise, and intelligence. Without this, lime and gypsum, bones and green manure, marl and guano will be of little use.

I believe in good fences, good barns, good farmhouses, good stock, good orchards, and children enough to gather the fruit.

I believe in a clean kitchen, a neat wife in it, a spinning wheel, a clean cupboard, a clean dairy, and a clean conscience.

—Henry Ward Beecher

FIG. 1. The right use, management, and remuneration of hired labor are three important features of businesslike farming.

CHAPTER 1

Farming in a Businesslike Way

By ANDREW BOSS, *Professor and Chief, Division of Agronomy and Farm Management of the Department of Agriculture of the University of Minnesota. He was born, and lived for 22 years, on a farm in southern Minnesota. During this time he received a common-school education, but from the time he was 15 he managed a 360-acre farm owned by his father. When 22 years old he entered the School of Agriculture of the University, where, after graduating, he became foreman, then assistant, and finally professor of agronomy. Since about 1903 he has had charge of the live-stock, farm crops, and farm management work; having also been made Vice-director of the State Experiment Station, he has been in contact with all its substations and experimental farms. During all the time that he has been engaged in the Department of Agriculture he has had charge of numerous farms and has kept up with modern methods of farm operations. Through the extension work in farm management he is constantly in touch with the farmers in Minnesota; moreover, the nature of the teaching developed by his institution has been instrumental in keeping him familiar with practical farm conditions.*—EDITOR.

SYSTEM in business. No large business can succeed unless it is systematically conducted. Great engineering feats are accomplished in railway and road building and in the construction of buildings and machinery. Large manufacturing establishments turn out vast quantities of products of various kinds that are uniform as to composition, quality, and usefulness. Large corporations transact vast amounts of business and amass huge fortunes from small margins of profit. Farmers and others often marvel at the success of these great organizations and wonder how it is attained. If the answer were reduced to one word, that word would be "system."

But a business cannot be systematically conducted without careful planning of its details and careful organization for efficient operation. An example will illustrate: The successful merchant in organizing his business first makes a study of the situation. He considers the needs of the community, the present and prospective demand for goods of certain kinds. He notes the supply and the cost of each article he is to handle, and inventories his resources. He calculates the cost for the labor that will be required to operate his business, and for equipment, taxes, insurance, and other items of expense he is obliged to meet. He regulates his purchases and his prices by the cost of securing his goods and of putting them on the market, and by the competition

he is likely to meet. If the business is a large one, it will be organized into departments. Each department will be put in charge of a responsible head. The labor and accounting charges will be so systematized and recorded as to show the profits and losses from each department and from the business as a whole. Systematic methods of accurate accounting, the knowledge of costs and of the expense of operating the business, enable him to eliminate from it all unprofitable lines and enterprises, and to show where the most efficient service is being given. Thus he weeds out of his business operations all needless steps and competition, and avoids needless waste of time and energy. Systematic organization of the business is the keynote to success.

System in farming. To succeed as well with the farm business as the best business man succeeds, requires that farming also be organized and systematized. In establishing a farm business, the farmer should make a study of the possibilities. He should consider the character of the soil and the climate, the demand that will be made upon the natural soil fertility by the crops grown, and the type of farming to which the locality is adapted. He should consider in connection with the draft on soil fertility the sources from which it may be renewed and at what cost. He must study the local markets, the transportation facilities, and the terminal markets, and the demand for such crops or livestock as he proposes to raise. He must consider the available labor for the operation of the farm business and the prospects for hiring additional labor. He must consider the cost of producing crops under these conditions and the probable net profit that can be gained from their production. In studying the problem, interest on investment, taxes, insurance, and other expenses must be included as they affect the final result. The labor of the farmer and of his family should be rated at a fair wage and included as a part of the cost of making the various crops or farm products.

In the operation of a large farm it is frequently necessary to organize in departments in much the same manner that a store business would be organized. This involves keeping accounts with the dairy, with the swine, with the grain crops, and other similar enterprises. Where the enterprise is large enough, it is well to put an expert in charge of each large branch or group of activities, thus enabling one to use cheaper labor in performing the work or to make the labor more effective by closer supervision. With farming so conducted, and where accounts are kept with the various lines of work, it is possible to make a business statement at the end of the year which will show which lines have been profitable and which have been unprofitable, and whether the farm business as a whole has paid a fair rate of interest. A business statement of this kind will show the weak spots in the farm organization, the poorly paying enterprises, and those which should be eliminated from the business in order to permit greater profits from the investment and operation.

Three essential factors in successful farming. Of the many factors that influence the profits from farming, the most essential ones are: (1) the planning of the farm business; (2) the execution of the plans; and (3) the recording of the farm transactions. The first two of these are treated in this chapter, the third in Chapter 2.

The plan. A well-balanced farm business cannot be developed unless much careful planning is done. Plans must be made that provide for economic buying and for successful selling of the farm products. The type of business, the size of business, and the use of capital and labor, must all be carefully fitted together if the best results are to be obtained. The use of lands, the cropping system, the kind and number of buildings, and the labor requirements, must all be adjusted if loss is to be avoided. The kinds and amount of livestock to be raised and the use to be made of crops and products that will be

grown for sale, must be planned for if a systematic business is to be built up. Hit-and-miss methods of farming do not make for a steady volume of business and will not permit the profitable employment of labor and equipment. A well-planned farmstead and correctly laid fields will avoid waste of labor and energy.

The execution. In the execution of the plans great skill is called for on the part of the farm manager. It is one thing to make plans and another to put them through. The management of labor is a very essential factor in securing profits from a farm. Investigation of the question indicates that it is the most important single factor in the farming business. The kind of labor that should be employed, the reward for labor, contracts with labor, and the assignment to duties, are essential parts of the farm business and must receive careful consideration and prompt execution if the best results are to be obtained. Marketing the product and buying supplies is also an important part of the farm business and calls for executive ability on the part of the farm manager. Too much attention cannot be given to a study of the needs of the farm business and to the prompt transaction of the daily tasks.

The records. It is impossible to understand the farm business or to know the profits, or gain made, or the losses incurred, without records of the important transactions. While the ordinary farm business does not call for extended bookkeeping, it does call for a few accurate records that show the essential facts relating to the farm business. With adequate records on which to base the knowledge of the farm, it becomes possible to eliminate promptly, or as circumstances will permit, the unprofitable enterprises, the non-paying cows, or the non-productive labor.

Planning the Farm Business

In the organization of a farm business there are certain cardinal principles which must be observed. Capital, land, and labor are the primary factors in agricultural production. The adjustment and correlation of these factors in correct proportions is one of the most important parts of the farm business. This adjustment cannot be made without careful calculations and planning by the farmer. Production is limited by the factor which is deficient. If there is not sufficient capital available, it will be impossible to build up a big business or to equip the farm fully with livestock, machinery, and implements, or to employ sufficient labor to operate the machinery and to work the land well. If labor cannot be secured, there is again limited production because farm operations cannot be performed at the proper time and the farm equipment and land cannot be used to the best advantage. If land should be the deficient factor, capital invested in tools and equipment is wasted because they cannot be used to their full capacity; labor cannot be kept constantly employed at productive tasks, and there is consequently loss of profit. Most careful planning of the relation of these primary factors is therefore required.

The Size of the Farm

The average-sized farm in the United States, according to the 1910 census, is 136 acres when measured by land area. When measured by capital value it is $6,444. Measured in terms of labor required for the farm, it is approximately a 1½-man job. It is safe to assume that these figures represent what is the best size of farm for conditions in the United States at the present time, because they reflect the combined judgment of all of the farmers in the country; yet this does not determine what is the best size of farm for any individual farmer. That must be determined by the circumstances surrounding the individual and the amount of capital he has to invest. Some types of farming demand much more

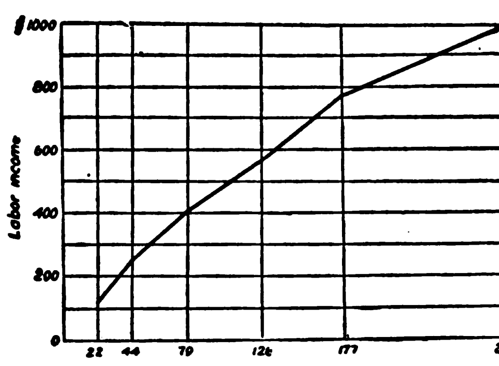


FIG. 2. Effect of size of farm (*indicated horizontally*) on income (*indicated vertically.*) Generally speaking, the larger the farm, the more money it makes. (N. Y. [Cornell] Bulletin 295.)

capital than others. The size of the farm must always be gauged by the kind of business to be done. It is important for most types of farming that there be a well-proportioned land area if the greatest profit is to be secured. It is impossible to build up a large diversified farm business on a farm of few acres, though a large truck, fruit, or other specialized farm business may not require a large acreage.

Agricultural surveys made in many different parts of the United States indicate clearly that the labor income of the farmer on the small farm is less than the labor income of the farmer on farms of medium or large size. There are definite economic reasons for this. On the small farm, devoted to the general crops of the locality and producing livestock products also, it is impossible to use either the machinery or the work stock to full capacity. The labor of the farmer and his family on a small farm is often unemployed or employed in unprofitable work throughout a large part of the year. A large proportion of the total products from the farm is required to supply the family, thus leaving but little to sell. A farm of 160 acres can be operated with only a little more machinery and equipment than one of 60 or 80 acres. As a consequence, a much larger acreage is handled for the money invested in equipment, and the cost of production is greatly reduced. Still larger farms offer the possibility of larger incomes through the more effective use of horse and man labor, and machinery. It has been frequently demonstrated that the medium-to large-sized farm can be the most economically equipped, the most efficiently operated, and that when properly managed it will return the largest income. Special types of farming, such as gardening, fruit raising, or poultry or bee keeping, may profitably be conducted on small land areas, and to them the above general statement will not apply. When land is cheap, it is wise to secure a large enough amount to permit the eventual development of a large business; but it is not wise to invest so large a part of the available capital in land as to prevent the proper equipment of the farm or to limit the employment of labor for tilling it. For a general type of mixed farming, 80 to 100 acres with a capital of from \$5,000 to \$6,000 is probably the minimum size which can be profitably operated. Only a few men are capable of getting maximum profits out of farms larger than 320 acres with a capital investment of \$20,000 or more. A larger farm business may be profitable in special cases, but more than average managing ability is required to operate larger enterprises successfully. The best size of farm must be determined by the type of farming and the kind of business to be done.

FIG. 3. Corn on a test plat which has grown the same crop for several years in succession. Compare with Fig. 4, to see the effect of rotating crops.

Type of Farming

The type of farming that may be successfully followed in a locality is determined primarily by the climate, soil, capital to invest, and the supply of labor. Transportation facilities, distance from market or shipping point, market demands, price of land, and the personal desires of the farmer are secondary considerations that must be carefully weighed if a well-balanced plan is to be made. The requirements for some of the more common types of farming are as follows:

Vegetable gardening. This type of farming must be intensive. It demands large amounts of labor and capital, but can be conducted on a limited area of land, which, however, must be highly cultivated. It should be located in the vicinity of a large city, near a terminal market, or in a particularly favorable locality. This type of farming requires 2 to 10 acres of rich, easily tilled land per family. It calls for industriousness and keen business ability, as the marketing problems are difficult and numerous, and demand good business judgment and prompt action. The profits from this type of farming may be large under favorable conditions. They are somewhat uncertain owing to market fluctuations, insect pests, and plant diseases.

A decided advantage in this type of farming is the quick returns from the capital invested. Many of the garden crops mature within 6 weeks or 2 months after planting. They are usually sold for cash and the money may be immediately reinvested. Gardening does not give profit-bearing employment throughout the year. Those who wish to make a large income in this business must capitalize highly and provide hotbeds and greenhouses so as to give employment to labor on profitable enterprises during the winter season. Vegetable gardening is not adapted to thinly settled sections, but follows best the development of large markets in large cities.

Fruit growing. Fruit growing, like vegetable gardening, is adapted to intensive farming and calls for high capitalization per acre. It also requires a large amount of labor when successfully followed. Fruit growing is adapted to somewhat larger land areas than truck gardening and is capable of extensive development. A farm family can well care for from 5 to 40 acres, depending upon the organization of the business, but sometimes much more land than this can be operated profitably when fruit growing is made the leading specialty. While this type of farming is often urged as particularly remunerative and easy, the opposite is usually the case. No type of farming calls for greater watchfulness and more attention to details. Destructive diseases must be kept out. Insect pests must be combated, and frequent spraying, pruning, and replanting are required in order to keep the fruit in bearing. If the best of care is given, it may be made a very profitable business, though the profits are often adversely affected by discouraging market fluctuations. Apple growing in some places pays a profit of from $50 to $150 per acre. Under very favorable conditions, it may be much more than this in favorable years. Other tree fruits pay correspondingly well, if given good care and if they are well marketed. It is a business for the specialist rather than for the general farmer. Fruit growing, like truck farming, is not particularly well adapted to a new country and is successful only on soils adapted to the fruits and in climates where they can succeed. Modern methods of transportation have to a large extent improved the facilities for marketing fruit, and the business is consequently expanding.

Single-crop growing. There are not many crops that can be grown continuously until the land is exhausted or becomes infested with disease, resulting in frequent losses. Cotton raising in the South, corn raising in some of the central states, and tobacco raising in some sections have been continuously practised for some years, resulting in seriously depleted soil and disastrous financial conditions. Single cropping requires much less equipment per acre than truck farming or fruit growing, and can be carried on in a more extensive way. In following a single-crop line of farming, it is usually necessary to resort to the use of fertilizers to keep up the production. Hay raising in the vicinity of large cities or markets is a common example of single-crop farming. This type of crop raising can be followed successfully longer than most kinds because of the freedom of grasses from disease and because the land kept in hay does not wash as badly as when cultivated for crop growing. It is safe to say, however, that no successful method of single-crop farming has been developed and except under unusual circumstances this type of farming should not be advised.

FIG. 4. Corn on a plat close to that shown in Fig. 3, but on which a five-year rotation is practised. (This and Fig. 3 from Minn. Bulletin 125.)

Diversified farming. Diversified farming is the most popular of any type and is more generally adapted to soil and climatic conditions in all parts of the United States. This type of farming properly includes both crop growing and livestock raising. The proper arrangement of crops in rotation aids in maintaining the fertility of the soil and helps the farmer to avoid competition between crops for labor. It also enables him to employ his help profitably throughout the year, since the large demand for labor by the livestock usually comes in the winter season when the demand for labor by crops is comparatively inactive. If the crops grown on the farm can be fed to livestock which is adapted to the locality and the market, quite as large profits can be made from the crops by marketing through the livestock as by selling them direct. The manure from the livestock, returned to the farm, will aid materially in keeping the soil in good physical condition and in maintaining the supply of chemical elements which are necessary in producing succeeding crops. The income from a diversified farm, because of the varying interests and sources of receipts, is much larger than from a farm where a single-crop system is followed. This type of farming is adapted to either large or small farms. The size of the business is often determined by the amount of labor available. Diversification allows a variation in the crops to be grown from year to year, and permits the production of livestock suited to the demands of the market. While it does not pay so large a margin of profit per acre as some of the intensive types, in favorable years, crop returns from the diversified farm are much more certain. The larger number of acres that can be handled

also enables the farmer on a diversified farm to earn a larger labor income than a man on the smaller farm who gets larger returns per acre. The average farm family on a diversified farm can supply all the labor for and can care for the products from 80 to 160 acres of land. When the farm is well planned and organized, and the crops and livestock are properly proportioned, it is easily possible for the average farm family to handle the crops and products from 240 acres or more. Gross returns from farms so handled should, with normal prices for products, be from $20 to $40 per acre, depending on the skill of the manager and the quality of the soil.

Livestock raising. Livestock raising has come to be looked upon as the highest type of general farming possible. In certain sections it has been made the main line of production. Livestock farming may include the production of beef cattle, sheep, hogs, dairy cattle, horses, and poultry. Some farmers will produce only one class of livestock, others will be so situated as to make it possible to produce profitably two or more kinds. The smaller animals are adapted to the smaller farms, and call for comparatively small capitalization. The larger animals, such as horses and cattle, are best adapted to large farms where grazing land is cheap and plentiful, and generally the animals can be handled in large groups. Stock raising of this kind calls for large investments in buildings and breeding stock. It requires also a great deal of labor and carries large risks. This field, particularly, calls for skilled management, good judgment, and business ability on the part of the farmer. Buying, finishing, and selling stock is quite as much a part of the business as the production of crops. Unless the animals are well matured and sold to advantage, there is likelihood of large loss. Where good management can be given, however, livestock raising is one of the most remunerative types of farming and provides an almost certain income. Dairying, especially, is expected to bring a sure income, when conducted in the vicinity of good markets.

Distribution of Capital

The money invested is a large factor in earning an income from the farm. Few farmers think of this, but it is a fact nevertheless. Bankers recognize the earning power of money when they pay 4 per cent interest on savings deposits and loan these same deposits on farm lands at 6 or 8 per cent. Business men are careful to invest their money where it will not only yield interest, but where it can be turned over quickly, thus early yielding profits. Farmers must study this question and so invest their money in the farm business as to earn the quickest and largest returns.

Farm capital may be divided into two classes: (1) permanently invested or "fixed capital"; and (2) temporarily invested or "operating capital." The first class is represented by the investment in land and improvements such as buildings, fences, wells, drainage, etc. The second class includes money invested in teams and other livestock, seeds, feeds and supplies, and cash for running the business. Farm management investigations have clearly shown that a relatively large proportion of the total capital should be used as operating capital. These studies show that the farmers who reserve sufficient capital to employ help when it can be used profitably, or to buy stock for feeding purposes when there is promise for profit, or for some specific enterprise when conditions are favorable, receive greater returns from their farms than do those who invest too large a part of their capital in the fixed form, such as land and buildings. Studies in Wisconsin show that certain farmers, who had 86.5 per cent of their capital invested in the fixed form and only 13.5 per cent in operating capital, received a labor income of only $168. Certain other farmers, who had only 71.8 per cent of their capital in fixed form, and 28.2 per cent

ORIGINAL FARM PLAN

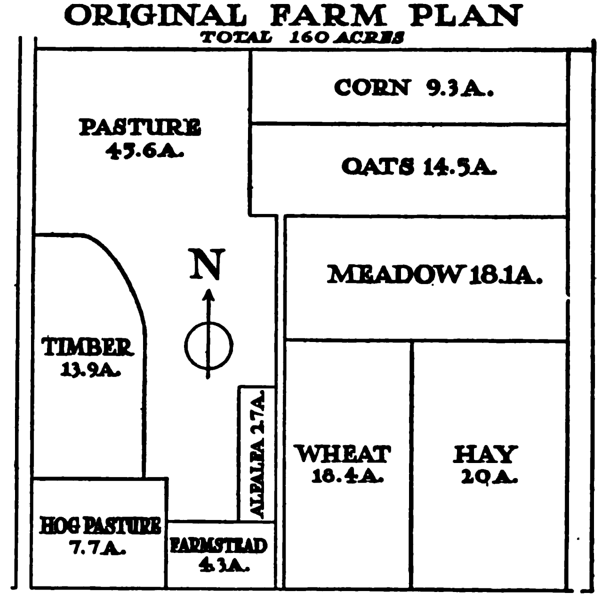


FIG. 5. Outline map of farm as originally operated. Note irregular shapes and unequal sizes of the fields. Compare Fig. 6

in operating capital, received a labor income of $1,629. Other studies made in various parts of the United States support this statement and indicate the wisdom of a generous investment in operating capital. Just what this proportion should be will depend upon the type of farming and the circumstances of the individual. For the average diversified farm, approximately the following proportions should give satisfactory results:

Fixed capital	Land	45 per cent
	Buildings	20 " "
Operating capital	Livestock	22 per cent
	Implements and tools	8 " "
	Cash for operating	5 " "

It should be borne in mind that in buying a farm and equipping it with new machinery, the proportion in the land investment will run lower than indicated, while the values in implements and tools will be higher. The machinery, however, depreciates in value, with use, while land is likely to increase in value as it is developed and put under tillage. In the older communities the proportion of the investment will change greatly. On small farms near terminal markets, the machinery investment may become comparatively insignificant and the proportions will vary decidedly with the increase or decrease of livestock.

Disposition of Products

In planning the farm business the whole problem of what to produce and how to sell it should be thoroughly worked out. Changes will be necessary as agricultural developments and new economic conditions arise, but the general plan of disposing of the product can be laid. Such matters must be considered as the kind of product that will be in demand, the amount that can be produced, storage and preparation for market, the kind of package in which it can best be delivered, the transportation facilities and charges, the condition of goods on arrival and the distribution system through which they must go to the consumer, the commissions to be paid, and the total expense that must be met. These questions all affect the profits to be made and determine whether or not it is wise to undertake certain lines of production. These questions can all be thought out in advance, if attention is given to them. They are a part of the business plans of every successful farmer.

The labor supply. It is impossible to build up a farm business without giving consideration to the question of labor. Large quantities of man-and-horse or motive-power labor are required if a big farm is to be operated. Investigations show that in general farming at least one man is needed for every 100 acres of land, and that one horse, or the equivalent in motive power, is needed for every 30 acres. More intensive crops demand more labor than this. It would be very unwise for a farmer to try to operate 500 or 600 acres of land, if his crew were limited to 2 men and 8 horses. The requirement of the farm for both man and horse labor should be conservatively calculated in planning the farm organization, and estimates made of the possibility of hiring or otherwise supplying the amount needed. If it cannot be provided, the plan must be modified to meet the possibilities of the case. More will be said on this subject under "Labor requirements" (p. 16).

Planning the Farm Layout

A well-planned farm is a source of constant satisfaction. It may also be a source of increased profits. An outline map of the entire farm, showing the location of the farmstead, the size and shape of the fields, and indicating the rotations to be followed and the crops to be raised, can readily be made (Fig. 5, and Fig. 336 in Vol. III.) A map of this kind makes it easy to record the yield of crops from the various fields and the operations on each. It can also be used for recording the application of manure and such other facts about the farm operations as may be desired.

The working out of a map of this kind helps the farmer to see and correct the weak spots in his plans for cropping and operating the farm and, when well done, leads to more uniform production and a more steady volume of business. Frequently it will be necessary to work out a temporary plan which can be modified or changed from year to year until the permanent plan can be followed. The completed plan is shown in Figure 6.

When the permanent plan is finally perfected, several outline copies should be made, so that they may be used as wanted. One can be used for a yearly crop ledger plan, as shown in Figure 7; another, as a record of manuring, as shown in Figure 8.

The Farmstead

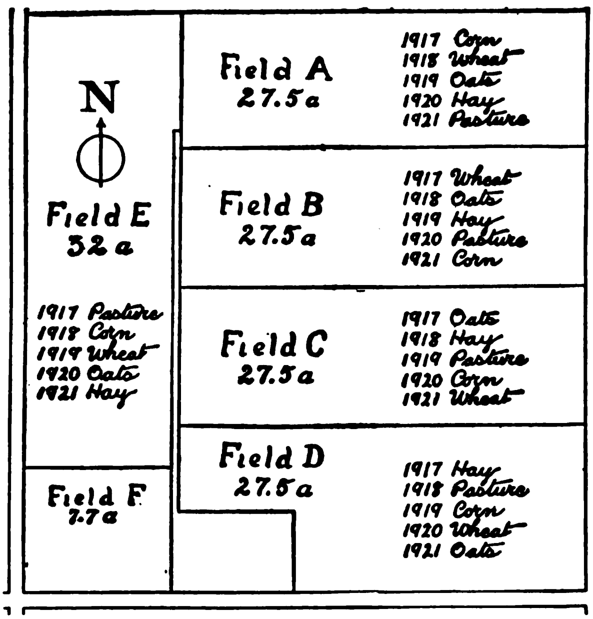


Fig. 6. Map of farm shown in Fig. 5 after being rearranged, giving size of each field and the proposed rotations. Field E should be divided into several smaller plots to provide for hog and calf pasture as well as special crops such as potatoes or seed corn.

Planning the farmstead. The operations of the farm are directed from the farmstead. It is the most important place on the farm. For this reason it should receive careful attention in laying out the general plans. The location of the farmstead is important from several points of view. In the first place it is to be the home of the family and must be pleasantly situated. Preferably it should be on relatively high ground where a good view can be obtained of the landscape and farm, and where it is not too far from the main roads of local travel. For convenience in getting crops to and from the fields, it should be located as centrally as possible without violating the first principle mentioned. Many trips are made from the farmstead to the fields, and if, located at one end of the farm or at a corner, it may mean very much unnecessary travel in getting crops in from the field and getting manure back to them. The arrangement of fields, lanes and fences, may also greatly influence the distance to be traveled in doing farm work (See Fig. 9). It is important that the farmstead be well drained. Locating it on high land with a good slope in all directions gives the best drainage. Sometimes artificial drainage is necessary, if the farmstead is located on low ground. Muddy yards and stagnant ponds are decidedly objectionable in the farmstead. They are disagreeable to work in and around, and may be the source of malignant diseases. It would be better to incur extra travel in handling the crops than to locate the farmstead in an unsanitary spot.

Size of farmstead. The size and shape of the farmstead will be determined by the type of farming to be followed. There is a temptation in the development of many farms to make the farmstead too small. It should be large enough to contain all of the farm buildings and to give protection to them through the planting of windbreaks when such are not naturally provided. A farm that is devoted to grain growing or single crop raising, may need but few buildings. If but little livestock is raised, paddocks and yards need not occupy much space. A fruit farm or vegetable farm located on high-priced land near large cities should occupy but little land for the farmstead. Possibly one or two acres would be sufficient for the purpose. On a grain farm, two or three acres may be sufficient. On the average diversified farm of about 160 acres, 4 to 6 acres is not too much to use as a farmstead. Larger farms and those on which livestock raising is followed extensively may require as much as 10 acres for the proper arrangement of the buildings and paddocks. While it is desirable to have a farmstead of adequate size, no land should be wasted. Every bit of the land should be put to good use. No vacant spots should be left to grow up to weeds. Lanes, paddocks, and courts should be kept clean and tidy. This can often be done by pasturing down frequently with sheep or other light animals. Even the lawn and dooryard can often be pastured down to good advantage. The shape of the farmstead is often determined by the lay of the ground and by natural surroundings. Groves, lakes, or other natural formations may be the deciding factor. When space and the lay of ground will permit, a rectangular outline is best on most farms. Curved drives and walks may be laid out on the inside of the farmstead to give beauty and attractiveness to the place, but the general outlines will be on the rectangular order. A desirable farmstead is shown in Figure 10.

Location of buildings. The location of the buildings on the farmstead is an important matter. The work in certain buildings is more or less related, and it is a wise plan to group together buildings which call for work of the same kind, thus obviating needless

travel across the farmstead. As an illustration of this point, it may be mentioned that a farmer seldom goes from the horsebarn to the field without taking a piece of machinery with him. To get the machinery, he must visit the machine shed, if the machinery is properly housed, as it should be. Economy of time, therefore, will demand that the machine shed be placed near the horsebarn and the fields. Similarly the feed supply is most commonly used in connection with the production of livestock. For that reason the granary or storehouse should be located near the barn or it should be made a part of the barn itself. When grain is threshed or purchased, it may then be placed in the storage rooms, and need not be moved again until wanted as feed for livestock.

The corn crop in the corn-growing states is fed largely to hogs and to fattening cattle. It is essential, therefore, that the corncrib be located near the feeding yards, so that it can be taken directly from the cribs to the feeding floor or the feeding bunks. When only a small amount of corn is fed, this may not be an important matter, but when large numbers of animals are raised it may be the means of saving large amounts of time. The unnecessary travel caused by poorly placed buildings is illustrated in Figure 11. In the placement of buildings on the farmstead, the farmhouse should receive first consideration. It should be placed at least 75 to 150 feet from the main road, so as to avoid the annoyance of dust and too much noise from passing travel. It should be situated 100 feet or more from any of the barns, and protected as much as possible from objectionable views and odors. The other buildings can be placed in the order of their importance and with the view of making use of any natural advantages that the location may give.

Inside plans of buildings. The floor plans and inside arrangements of the buildings should receive close study. Convenience in doing chores is a great factor in saving labor. Lines of stalls should be arranged to permit the most rapid work in caring for the animals. Access to feed supplies should be convenient. Feed storage rooms and bedding supplies should be where they can be easily reached. Arrangements for watering the stock, either in the barn or in tanks close by, should be provided. It is surprising how much time can be saved in doing chores in a well-planned barn.

Yards and paddocks. Sufficient yards, paddocks, and small pastures should be provided where livestock is raised, to provide for outdoor exercise and grass as needed. It is wise to change paddocks frequently. Therefore, one or two extra ones can well be included. The yards and paddocks should be close to the barn, with suitable permanently fenced lanes closed by strong gates so as to prevent the livestock getting out. The small pastures may be farther away, but should be included inside of the windbreak, so as to get protection from cold winds, and also that they may be more constantly under the eye of the caretaker. It is well to plan the farmstead large enough so that it can be expanded without destroying the windbreak or replanting. Even though the farmstead is not all used to begin with, a developing farm business may rapidly grow to it.

The Field Plans

Well-planned fields may be as great an assistance in saving labor in doing the farm work as a well-planned farmstead is in doing the chores. There are a few vital principles which should be followed in laying out the fields. It is economy to so arrange the fields as to lead directly toward the farmstead. This arrangement does away with loss of time in getting to and from the fields, and is an important factor in securing an equal distribution of manure over the entire farm. Short roads well made should be the rule.

Size of fields. The size of the

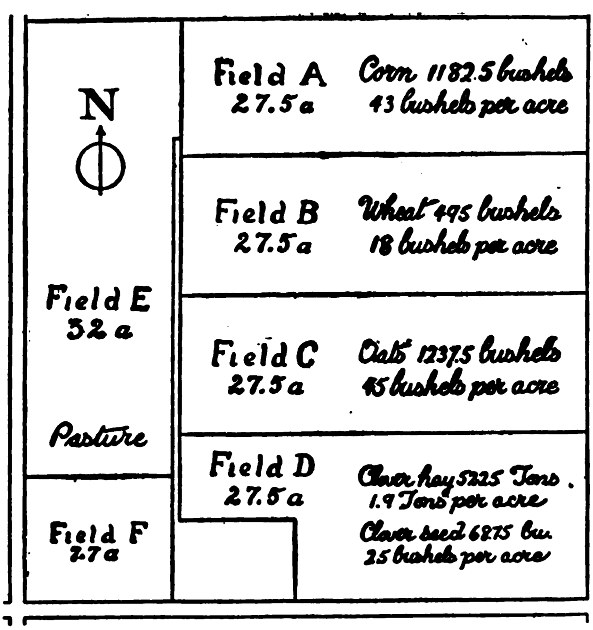


FIG. 7. Same map as shown in Fig. 6, used for recording the crop production of each field. Such a record for each year can be bound or pasted into a book to supply a permanent history of the farm. Dates of plowing, planting, etc., can be added, if desired.

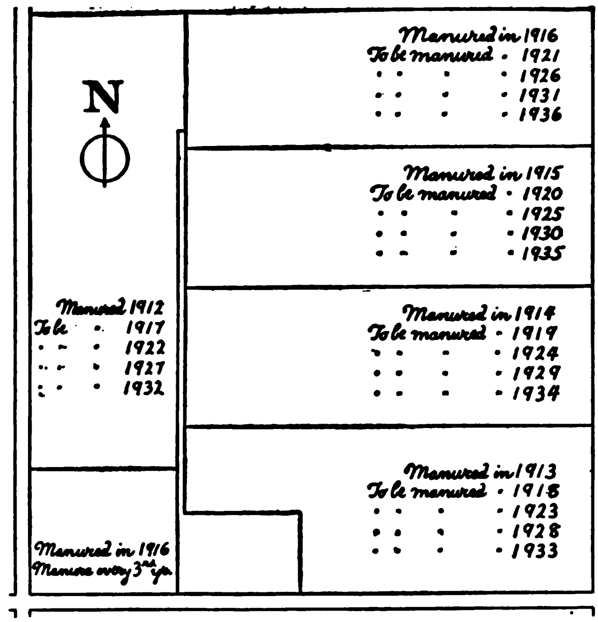


FIG. 8. The map can be used to keep track of the manuring system. An even distribution of manure is desirable, and, unless one keeps track, certain fields are likely to be overtreated at the expense of others.

fields is an important factor in planning the farm. So far as possible they should be uniform as regards both size and the quality of land. Uniformity in size leads toward making the farm business systematic. Evenness in character of soil permits working the whole field at one time. Fields of even size also enable the farmer to provide a definite acreage of each crop each year, and permit him to regulate more easily the amount of livestock to be kept, thus insuring a constant supply of food for the stock and a steadier volume of business than where the fields are irregular in size. This results in more uniform income to the operator. So far as possible, the fields should be of good size. They must be suited to the rotation that is to be followed. It is understood of course, that it is not possible to change the size or the shape of fields materially on many farms because of the topography of the land. Creeks, rivers, sloughs, or stony ridges may be factors which determine the shape of the fields. These matters must all be studied carefully and the plan followed which gives the balance of advantages.

Shape of fields. So far as economy of teams and machinery is concerned, long, narrow fields are better than short or square ones. Opposed to this principle, however, must be set the expense of fencing. Square pieces of land are much more economically fenced than long ones. If the combination of livestock raising and grain growing is followed, a compromise must be reached between these two opposing factors. As a rule, the rectangular field about twice as long as it is wide, is best when both of these factors are considered.

Rotation plans. It is no longer considered safe to crop land continually to the same crop. Such a practice is almost sure to lead to various kinds of plant diseases and to result in loss of crop. A rotation of crops is best under most circumstances. The adoption of a crop rotation and the division of the farm into fields of regular size tend to decrease the number of failures rather than to increase them, and helps to systematize and make uniform the business of the farm. The plan of rotation to be followed depends altogether upon location, the type of farming, and the amount of livestock to be kept. No matter what rotation may be followed, it must be built around the principle of a change of crop in systematic order. A true rotation provides for a succession of crops of different kinds. For ordinary purposes, crops may be classified as (1) grain crops, (2) grass crops, and (3) cultivated crops. A successful rotation will have a proper combination of these 3 classes. There must be a field for each year in the rotation followed, or changes in crops cannot well be made. A good three-year rotation would call for the division of the farm in three equal-sized fields, with one year devoted to grain, a succeeding year to grass or clovers, and the third year to cultivated crops. Whether such a rotation can be strictly followed or not depends upon the kind of business done. In some localities, one third of the farm should not be in cultivated crops. In others, grain raising will not warrant one-third of the farm to be devoted to that crop. In that case there are two alternatives. Either one field may be divided and some other crop put in temporarily, or the farm may be redivided into smaller fields and a longer rotation term adopted. A 5-year rotation, for instance, would call for the division of the farm into 5 fields of correspondingly smaller size. A suitable rotation for that kind of a farm in the corn-growing districts would be: first year, grain; second year, timothy and clover hay; third year, pasture; fourth year, corn; and fifth year, corn. This is not a perfect rotation, in that it calls for the same crop for 2 succeeding years. There is no harm, however, in raising hay or grass 2 years on land; and corn can be safely grown 2 years in succession where the land has been proper-

ly manured and cultivated. The essential thing is to plan the fields and adopt the rotation that will meet the needs of the farm business. The kinds of crops that will be grown and the quantity in which each will be grown will depend very largely upon the kind of livestock raised, the demand for feed, and the possibilities of selling on the market for cash. Good crop rotations are shown in Figures 12 and 13.

Plans for maintenance of fertility. The productive capacity of the soil determines largely the profits that can be made from farming. Unless the soil fertility is maintained, it will yield but poorly, often not paying for the labor put upon it. The scheme of cropping adopted should provide for the maintenance of fertility and should induce large production. It has been shown that production cannot be maintained without incorporating in the soil a good supply of vegetable matter. This vegetable matter may be supplied either by plowing under green crops or by the application of barnyard manures. In the best systems of farming, both expedients are resorted to. Clover, cowpeas, alfalfa, and other legumes are especially useful in maintaining soil fertility. These crops gather nitrogen from the air and incorporate it in their own structure. When these crops are plowed under and allowed to decay in the soil, they thus add large quantities of nitrogen to the soil. Phosphorus, which is another element of fertility most likely to be depleted, can be supplied only through the addition of barnyard manure or by the application of the commercial forms of phosphate. All of the necessary elements of fertility can be supplied to the soil in liberal applications of barnyard manure. It is for this reason that livestock raising on high-priced land and in thickly settled localities is so popular. Fertility can best be maintained by liberal applications of barnyard manure and by the use of legume crops for green manuring. Corn stalks, grain stubble, and most other crop residues may often be plowed under to advantage. While not so rich as the legumes, they possess considerable fertilizing material and help in keeping the soil in good physical condition. For certain crop conditions, acid phosphate, rock phosphate, potash and other forms of commercial fertilizers can be used with profit. The best results will usually follow their use in conjunction with the farm manures.

Livestock Plans

Large quantities of cheap rough feeds for which there is no market are grown on most farms. These feeds cannot be transported to market profitably on account of their bulk. Straw from the various grains, corn fodder and silage, and the aftermath from the meadows are examples of this class of foodstuffs. Many farms contain rough land which is difficult to till. Such land will often grow good grass and make good pasture. It can be made to return cash to the farm through the use of livestock. Pasture, even on comparatively expensive land, is one of the cheapest animal feeds that can be provided. Investigations show that the greatest profits from livestock are made where animals are raised on these cheap feeds. Expensive grain feeds may profitably be fed to livestock at the finishing period or for special production, but experience has shown that it is not profitable to raise livestock for market purposes on highly concentrated marketable grains.

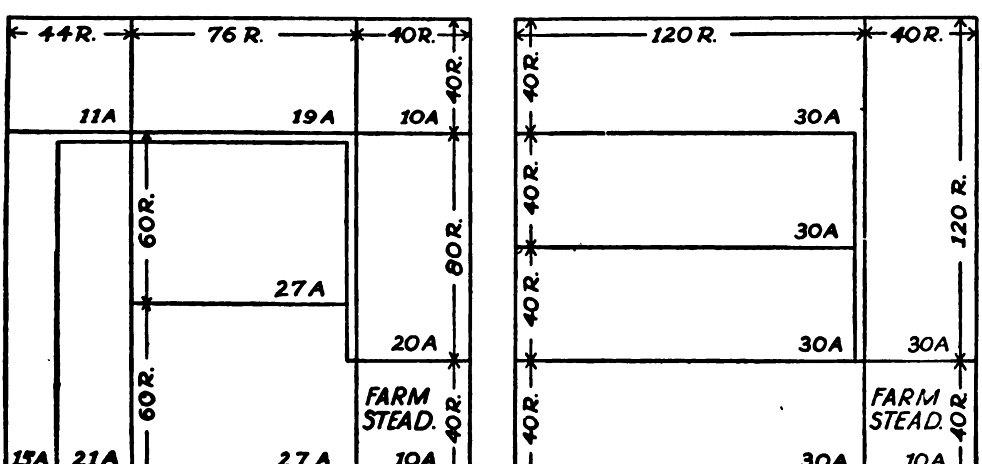


FIG. 9. A poorly planned farm (*left*) and a well-planned one (*right*). In the first the average distance from farmstead to fields is about 70 rods; in the second, 24 rods. On this basis it will take a man and team 4 days more to grow a 30-acre field of corn on the poorly arranged farm than on the other.

The kind of livestock to keep, therefore, and the amount of livestock are determined largely by the amount of pasture land available and by the amount of coarse roughage grown that cannot be disposed of except through the medium of livestock. Necessarily, the kind and amount of stock that can be kept will vary with the sections of the country in which the farm is located. For average conditions under which general farming is followed, however, it is believed that there should be one cow kept or the equivalent of other livestock, to each 4 or 5 acres of land. Under such conditions the animals can be maintained largely on the cheap feeds of the farm, and will in return provide manure enough if carefully husbanded to maintain permanently the fertility of the land. On very productive soil and under intensive systems of agriculture, it may be found profitable to have as much as one cow, or the equivalent, to each two acres of land. Under range conditions, not more than one such animal to each 10 acres of land may be advisable. No fixed rule can be laid down that all can follow, but farmers are urged to study conditions which prevail in their locality and to observe the principles laid down.

Shelter. Shelter for livestock is necessary in almost all localities. The quantity of shelter, however, varies with the climate and with the kind of stock to be raised. The smaller the investment in shelter, of course, the less expense or cost of production. The plan of the farm, however, will not be complete without providing adequate shelter for the class of stock that is to be raised. Sheep and beef cattle do quite as well in open sheds with only sufficient protection from cold rains and snow. Dairy cows must be more carefully housed if they are to give the largest production. Plans should be made, not only for winter protection, but also for protection against flies, ticks and other pests. Dipping vats are an essential part of the equipment in the South.

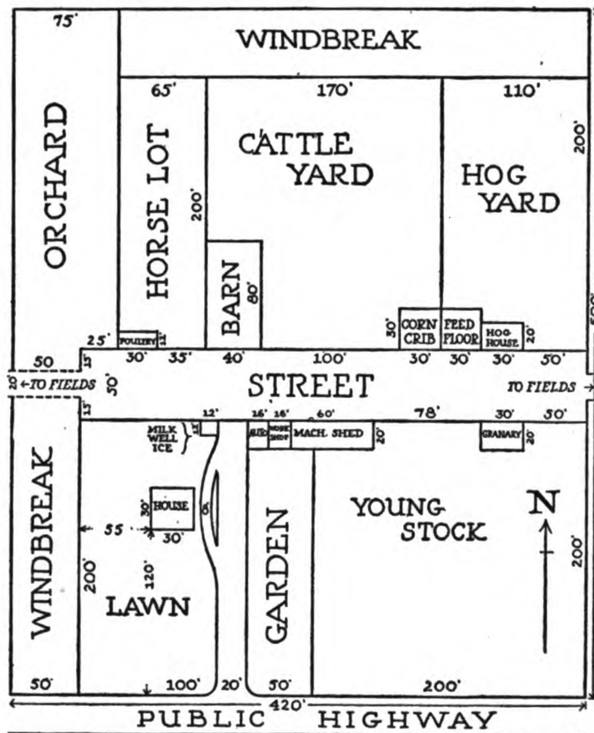


FIG. 10. A well-planned farmstead. Note location of machine shed near barn and on direct line of travel to field; that of workshop and combined milkhouse and icehouse between house and barn; that of the kitchen garden near the dwelling; and the close, convenient grouping of all the buildings.

Feed Supplies. If much livestock is kept, the farm manager must look well ahead and make sure that he has sufficient feed supplies in sight to meet the demands. Profits from livestock raising are quickly consumed through the purchase of feeds. It is often better to depress the amount of livestock grown in feed shortages than to overstock and have to purchase large quantities of high-priced feeds. In order to determine the feed needs of the year it is necessary to decide on rations that will be fed and to calculate the amount required of each class of feeds. This can quite as well be done a year in advance as to wait until the feed is needed, and often will indicate to the farmer what feeds must be bought. By knowing beforehand he can take advantage of market depressions and buy when they are low or sell his surplus when high. Likewise, complete plans for the care and management of the stock are essential. A knowledge of the available labor plans for feeding, and method of management, is of great use in avoiding loss.

Planning the Labor Requirements

A successful year's business cannot be planned out without taking into consideration the labor requirements of the farm. It is a difficult thing to

know just when a man is doing a full day's work. A study of possibilities is worth while. Investigations show that normally about 3,000 hours of labor may be expected from a man in the year. This means the equivalent of 10 hours per day for 300 working days. This is somewhat less than farmers generally believe they should expect from farm labor; but it is based upon records of what has actually been done on a large number of farms covering a period of 12 to 15 years, and is approximately what may be expected. When a farmer knows, for instance, that he can expect 3,000 hours of labor per year, or 250 hours per month, he can make calculations on how many men to hire, provided he knows what would be required in the production of crops and in caring for livestock. These figures have been determined for Minnesota, and can likewise be determined or closely estimated for other localities. The accompanying table shows the labor requirements for producing field crops in Minnesota from 1902 to 1912.

TABLE I—AVERAGE ANNUAL HOURS OF LABOR PER ACRE REQUIRED IN PRODUCING FIELD CROPS, 1902-1912

Crop	Average Hours Per Acre	
	Man	*Horse*
Wheat, shock-threshed	12.3	29.9
Oats, shock-threshed	13.5	28.9
Barley, shock-threshed	12.8	29.9
Fall rye, shock-threshed	10.3	27.2
Flax, stack-threshed	13.7	33.8
Corn, husked	26.2	54.2
Fodder corn, cut, shocked, and stacked	30.4	52.6
Ensilage	32.6	59.8
Potatoes, machine production	44.4	75.0
Mangels	180.7	99.3
Hay, timothy and clover, first crop	12.3	13.0
Hay, timothy and clover, two cuttings	20.7	21.5
Hay, wild	12.2	16.9
Timothy, cut for seed	5.1	7.1
Clover, cut for seed	9.2	12.3
Hay, millet	17.3	39.1
Hemp	14.3	27.4

The labor that will be required in caring for the livestock has likewise been determined for Minnesota, and is shown in Table II.

TABLE II—TOTAL HOURS REQUIRED ANNUALLY PER HEAD OF LIVESTOCK

Kind of Stock	Average	Hours
	Man	*Horse*
Horses	83.7	9.6
Cows	148.0	31.8
Miscellaneous cattle	11.1	....
Hogs	12.1	2.6
Sheep	2.9	0.6
Fowls (100)	141.2	9.6

Under similar conditions it is believed that these figures will hold in other states. Where conditions differ, a close estimate of the amount of labor per animal that will be required is about the best that can be done. With the requirements for crop and livestock labor known, it is possible to estimate how much labor must be supplied in order to carry on the business for the year. The use of this knowledge is illustrated in the following example:

ANNUAL LABOR REQUIREMENTS FOR A 160-ACRE WELL-STOCKED DIVERSIFIED FARM

Farmstead, 5 acres; permanent pasture, 40 acres; woodlot pasture, 10 acres; roads and waste land, 5 acres; crops, and labor in hours required annually.

	Man Labor	*Horse Labor*
Oats......25 acres	25 x 13.5 = 337.5	25 x 28.9 = 722.5
Hay (2 cuttings)...25 acres	25 x 20.7 = 517.5	25 x 21.5 = 537.5
Corn for ears....25 acres	25 x 26.2 = 655.0	25 x 54.2 = 1355.0
Ensilage corn....15 acres	15 x 32.6 = 489.0	15 x 59.8 = 897.0
Potatoes..10 acres	10 x 44.4 = 444.0	10 x 75.0 = 750
Total for crop production...	2,443	4,262

Livestock, and labor required annually to care for it.

	Man Labor	*Horse Labor*
Horses......... 6	6 x 83.7 = 502.2	6 x 9.6 = 57.6
Dairy cows....15	15 x 148. = 2220.	15 x 31.8 = 477.
Young cattle...24	24 x 11.1 = 266.4	....
Hogs..........30	30 x 12.1 = 363.0	30 x 2.6 = 78.0
Sheep.........40	40 x 2.9 = 116.0	40 x 0.6 = 24.0
Total for livestock........	3467.6	636.6

Total crop and stock labor..........	5,910.6	4,898.6
Add for maintenance or nonproductive labor, 22% or...............	1,522.3	1,099.6
Total all labor.................	7,432.9	5,998.2

If one man can be expected to perform 3,000 hours of labor per year, as previously stated, then it will require 2.8 men to perform the man labor on this farm. This would mean 2 men throughout the year and an additional man for 10 months. Or 2 men and a well-grown boy employed for the full year could care for the work. It has been calculated that a work horse can be expected to perform about 4 hours' work per day on such a farm. At that rate a horse would perform a total of 1,200 hours in 300 working days.

There would be required, therefore, to do the work properly, 5 horses. If much pleasure driving is indulged in or colts are raised, 6 should be kept.

The addition of 22 per cent to the productive labor is based on investigations which show that that amount of maintenance labor must be allowed for, to cover the total requirements for labor throughout the year.

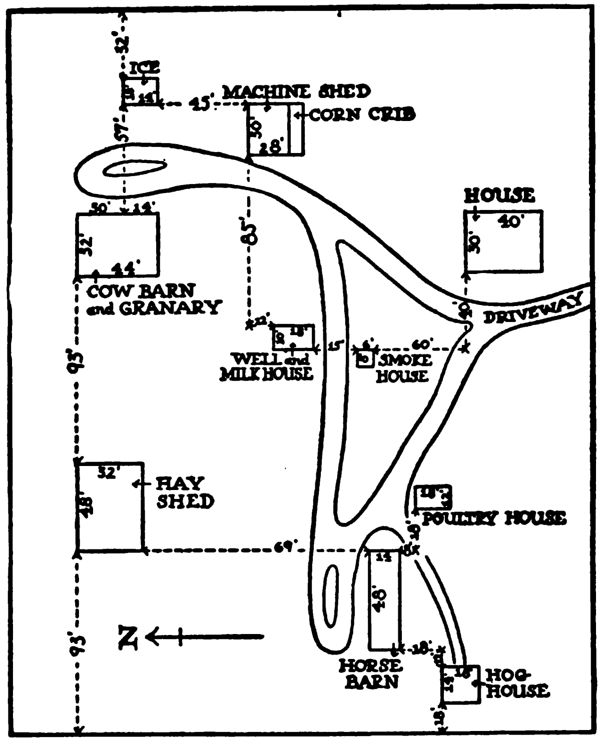


FIG. 11. A poorly arranged farmstead in which none of the buildings are placed so as to make their use fit in with that of others or with the daily trips about the barnyard. It can be shown that a rearrangement could save a whole month's time of a man each year in doing chores alone.

The Execution of the Plans

No matter how carefully thought out the plans for organization and operation may be, success cannot follow unless the one in charge of the farm is a good manager. This means that he must have executive ability, tact, and good business judgment. In the execution of the plans, he will be chiefly concerned with the direction of the labor of men and horses, in caring for the crops and livestock, with buying supplies and selling the products of the farm. On a large farm he may be fully employed in directing the labor and transacting the business. On a small or medium-sized farm he may, in addition, perform a considerable amount of the farm labor himself. His efficiency in directing the labor and in keeping it employed on productive enterprises, is one of the important determining factors in securing success.

Management of Labor

Kinds of labor. The management of farm labor may or may not be a serious task. A farmer on the average-sized farm in the United States pays out only $102 per year for hired help, according to the last census. This indicates that the larger part of the farm labor is performed by the farmer and his family. Family labor is usually very satisfactory for the reason that a personal interest is taken in the work. The management of this labor is much easier, as a rule, than the management of hired labor.

Hired labor. Where the demand for labor is greater than the farm family can supply, hired labor must be employed. This may be needed only for short periods during rush seasons when day labor may be employed. It may be needed for longer periods when the best results are obtained from hiring by the month or by the year. As a rule, the best help can be found for the longer period and steady employment. Day help usually costs more for the time employed than does help that is hired by the month or by the year, and is seldom as satisfactory.

A farmer's son who has grown up in the business is usually a very desirable farmhand. A man of this kind may often be found in the neighborhood, but ordinarily it will be best to hire one from a short distance away. If raised in the neighborhood, he is likely to have his work more frequently interrupted by calls from acquaintances and by a desire to take part in the social affairs of the neighborhood. If service only is required, one from a distant neighborhood will be most satisfactory. Sometimes a man can be had who has been for many years employed at farm labor, but

who has never been able to make a success in farming himself because he cannot plan work. Such men, when wisely directed and not required to do too much thinking, may give very satisfactory service. In some sections only transients can be had. In other sections, negroes, Mexicans, Chinese, or other cheap labor is the only kind available. Where such conditions are met, the labor must be closely supervised by the farmer himself or by a competent foreman who is constantly with the men. Even under such circumstances, transient or cheap help is rarely satisfactory.

The custom is growing in many places of providing small houses for laborers and giving them employment throughout the year. Young married men without capital are attracted by such opportunities. Older men with families, but without capital, may often be employed. This sometimes makes it possible for the farmer's wife to secure help in the house, as grown daughters may be able to help in emergencies. If arrangements can be made with such a family to board an additional man or two, it may relieve the farmer's family entirely from the necessity of caring for the hired help. To permit the employment of such help profitably, the farm must be large enough and the business intensive enough to employ the help on productive labor the year through.

Reward for Labor

Wages. On farms, as in other places, laborers must receive a reasonable reward for industry, or they will not remain satisfied nor give their best service. The most satisfactory reward for labor is a good cash wage. Compared with wages in other callings, farm wages have been low; and yet most farmers complain of wages being too high and good help being hard to get. The wage of farm labor in the North, including cost of board, has been 14 to 18 cents per hour during the past few years. This is lower than laborers in other lines of work have been getting, and has resulted in much of the best help going into other vocations. Higher wages can be paid by the farmers if they give attention to keeping the labor actively employed on profitable enterprises.

Rate work. Payment by rate or piece work has been tried to some extent, but does not seem to be a satisfactory basis of reward except for certain kinds of work. Cotton picked by the bale, corn husked by the bushel, or potatoes dug by the bushel, are examples of the kind of labor that can well be paid for on this basis. For most farm work, however, the hired labor must be used together with family labor, and can best be paid for in cash on the day, month, or year basis. Where men with families are employed, the cash wage may often to good advantage be supplemented by certain privileges, such as free living quarters, a small garden, or the use of a driving horse at certain times. These cost the farmer but little, and are quite important in keeping the help family satisfied and contented to stay. Good living quarters, good board, and fair treatment must be given any kind of help, if the help is expected to give loyal and efficient service.

If members of the farmer's own family assist with the farm work, they also should receive suitable reward. This does not mean always that they should be paid in cash. Where a son of 16 or 18 years is doing a man's work, however, his good will and interest can often be held by giving him a share in some enterprise, —a half interest in the hogs or in one of the crops, not only while they are growing, but on market day, will go far to arouse a feeling of responsibility. A share in the poultry or butter will often influence the girls of the family to help with the housework rather than to become waitresses in the village hotel. Such treatment will do much to keep the young people at home and on the farm.

Contracts for Labor

In hiring labor of any kind it is best to make definite terms as to the wages to be

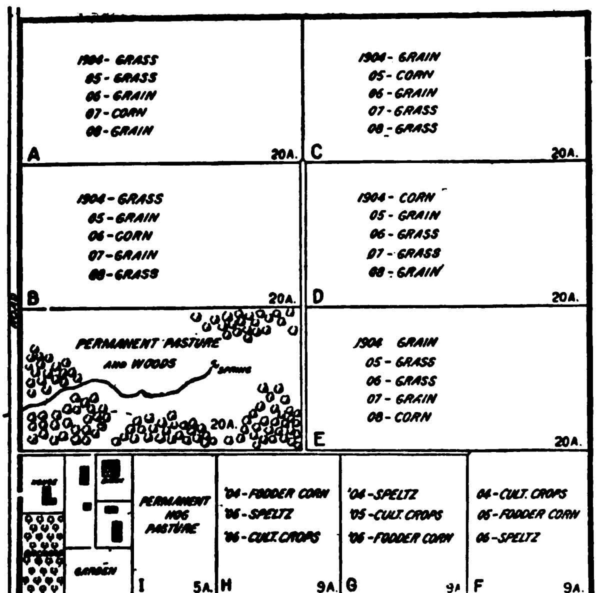


FIG. 12. A suggested rotation plan for a 160-acre diversified farm; involving a 5-course system on five 20-acre fields, and a 3-course system on three 9-acre fields. This leaves a 5-acre permanent hog pasture and a 20-acre permanent, watered stock pasture which can be supplemented by the aftermath in the grain fields.

paid, the work to be done, and the arrangements for board or living quarters. For long-term employment, the terms should be reduced to writing and each party to the contract should be supplied with a copy for reference. Witnessed verbal contracts are just as binding, but cannot so readily be reviewed or referred to in case controversies arise. Day labor or other temporary help may be safely hired without great care as to details, though the terms of employment should be definitely understood by each party.

If time off is to be allowed or holidays are to be observed, the time and days should be stated. Where a large amount of confining work, such as will be found on a large dairy farm, is to be done and a number of men are employed, it is often possible to arrange for the men to take turns in doing the necessary work on Sundays and holidays. In this way, each man gets his fair share of time off, resulting in greater contentment in the crew. The stipulation of a definite time when payment will be made is often wise. This may be to suit the conditions. Provision should always be made in employing labor for the termination of the contract. Nothing is so disturbing to the farm business as a dissatisfied employee. For this reason it is best to make an elastic contract that can be terminated by either party within a reasonable time after notice has been given.

Getting Work Done

The important thing in the management of labor is to get the work done promptly, effectively, and at the lowest possible cost. Other things being equal, the man who gets the greatest number of hours of labor from his help will have the largest income. To get the best returns from labor, the farm manager must recognize that there are two specifically different classes of enterprises for which work will be demanded. In the first class are the productive enterprises, such as preparing the soil for crop growing, caring for the crops, milking cows, feeding beef cattle or sheep, or picking fruit. Labor employed on such enterprises brings a direct return to the farm. In the second class, called nonproductive enterprises, are included such operations as the care of the farmstead and buildings, care of idle work stock, road building, and repair work. Labor employed on such enterprises cannot possibly bring direct returns to the farm. There is no way, however, of avoiding a certain amount of labor on such enterprises on any farm. The proportion of labor on nonproductive enterprises, needless to say, should be kept as low as possible. On well-organized farms with cropping systems well arranged, and with livestock in correct proportions the nonproductive or maintenance labor may be as low as 18 to 20 per cent of the total labor required. In farming under single-crop systems, the nonproductive labor may run as high as 35 to 50 per cent. This difference, applied to two farms using 6,000 hours each yearly, would mean that 1,000 to 2,000 hours more of the time of the men would be employed in producing crops and livestock on one farm than on the other. Naturally, it would be expected that larger profits would be made on the farm most usefully employing the labor. It is essential, therefore, that the farm manager keep in mind the importance of keeping down to the lowest possible limit the labor on nonproductive enterprises, and the wisdom of using his labor largely on work that will bring returns.

Assignment of work. Every laborer, whether hired or belonging to the family, works best when he knows in advance what he is expected to do. Therefore, each should be assigned certain definite parts of the daily routine. By repeatedly doing the same thing a person gains proficiency and can accomplish more. By having each member of the crew assigned to definite duties, confusion is avoided and loss of time as well. It is far better to have one man do the milking regularly while another cares for the horses and hogs,

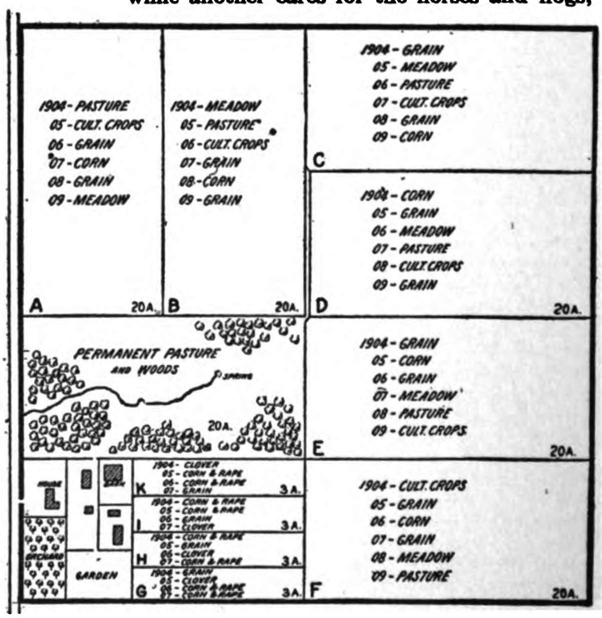


FIG. 13. Another possible plan for the farm shown in Fig. 12. The major rotation is a 6-course one, using six 20-acre fields; the minor, a 4-course one on four 3-acre fields. This does away with the hog pasture, but provides more other pasture than before.

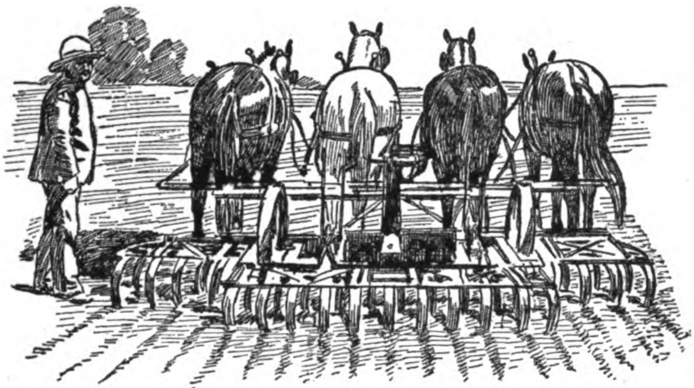


Fig. 14. Machinery should be purchased and used up to the point beyond which further expense will not bring increased crops or an actual saving of labor cost. It requires records and good judgment to locate this point.

than it is to change them about frequently. When confined to certain regular duties, men need less supervision and are more likely to become interested in their work. In this way they come to carry a part of the responsibility for getting results. In assigning the duties, care should be taken to observe so far as possible the likes and dislikes of each laborer for certain kinds of work. If one has a liking for cows rather than for horses and machinery, it is likely that he will give the best service in caring for the dairy as his share of the work. The one who likes horses and machinery should be assigned to the fields as his main responsibility. Each will, of course, have to do other things than care for his regular work, and both may have to combine on the performance of many disagreeable tasks, but both will be happier in their work for being employed the larger part of their time at work in which they are interested. In order to keep labor satisfied, it is important that the work be somewhat equally divided. If there are disagreeable tasks about the farm, these should not always be put on the same person. A combination of all on a disagreeable job, or an exchange in the order of doing it, will often smooth up the objections to such work and result in a much better satisfied crew.

Directing the labor. Most of the farm work in the United States is directed by the farmers who own and operate the land. Ordinarily the farmer performs the work in the fields or barns himself, using the help of such members of his family as are able to assist. When the amount of labor is more than can be performed by the family, he employs what is needed. In either case he himself is the manager and working foreman. No better combination can be made for getting the work done on small farms. The personal interest of the farmer himself, and often of the others, in getting the best results possible, stimulates industriousness and tends to eliminate waste and breakage. The intimate personal knowledge of all of the details of the farm business is a large factor in securing good profits.

On farms that are too large or too complicated to be operated by the farmer and his family, greater attention must be given to the supervision of the labor. Because the farm work is spread over such a large land area, it is seldom wise to employ more than 6 or 8 men without some one directly in charge as a working foreman. Usually this foreman can be picked from the crew, choosing one of the most efficient and reliable. By paying him a premium over the other men, his interest in getting a large amount of work done can be secured. On large farms where many men are employed, it may be necessary to have several such foremen. One may be put in charge of the barn work with certain helpers assigned to him, another may be given the responsibility for the field work, and still another may be put in charge of a crew engaged in making repairs and certain improvements. In this way the farmer becomes his own manager and superintendent, keeping in constant touch with the work of the farm through the foremen, and transacting the business. The foremen take the responsibility of keeping the men at their assigned duties and of having the work done as it should be. In an arrangement of this kind it is wise for the farmer or manager to deal only with the foremen of each crew, thus recognizing their positions and gaining for them the respect of the crew. In handling a crew of farm laborers it is essential that the one in charge know how to do the work himself and how much to expect in laying out a day's work for the men. When he does have this knowledge he will be able to detect shirkers and can better insist on a full day's work. He should always be on the watch for labor-saving methods and prompt to train his men to adopt them and to avoid wasted effort. If possible there should be maintained between the men themselves and between them and the foreman, a common interest in the work at hand. The foreman should be "a leader" rather than "a driver" in order to bring this about. The farm manager who can gain and hold the goodwill of his men has an asset which can be turned to good account in securing profits from his business.

Use of machinery in saving labor. Much

labor that was formerly done by hand is now done by machinery. Few operations on farms are done as they were 25 years ago. Most of the improvement in methods of doing farm work is due to the development of machinery. Self-binding harvesters, self-feeding blow-stacker threshing machines, gang plows, hay loaders, potato diggers and sorters, manure spreaders, milking machines, and gas engines are familiar examples of labor-saving implements. The equipment of a farm is not complete until it includes as many of these implements as the business of the farm can use profitably. There is no question but what machinery of suitable size and quality will aid materially in getting the work on the farm done promptly and in good order. Machinery should not be purchased, however, until it can be shown that it will be possible to save its equivalent expense in man or horse labor, or that it will materially aid in securing products of better quality. In determining these questions it is necessary to estimate the expense of doing the work with and without the machine. The plan should be adopted which gives the product at the lowest cost, unless the machine is wanted purely to relieve the farmer and his family from heavy drudgery.

Daily program of work. Farm work is subject to more sudden changes than most other lines of work. The duties of the farm are performed largely out of doors, and sudden storms or climatic changes may necessitate a change in the whole day's work. These changes cannot be made without loss of time unless substitute plans are at least partly in mind. Daily programs that may be approximately followed should be planned out by anyone charged with the responsibility of directing farm work. These should show what work is to be undertaken under fair conditions or stormy. Ordinarily they will be prepared a day or two in advance of the work. Certainly they should be prepared at least the night before. Thus, a "rainy day" program or a "cold day" program will be made up. There should also be programs for slack days in the summer season and also for the days when full time in the fields is called for. The making of such programs has two distinct advantages: (1) it helps the farmer to determine which operations should be performed first and how, allowing him to place his men to the best advantage; (2) having the plans well thought out enables him to give explicit directions promptly, thus saving time of both himself and his men. Sample programs are submitted herewith. It should be understood, of course, that the nature of the farm work will not permit following any program closely. Sick animals must be cared for, crop emergencies will arise, and numberless unforeseen circumstances will occur which will interfere with the plans. But with the plans for conducting the daily routine clearly mapped out and the work definitely organized, these interruptions may be reduced to the minimum. It should be understood that these are programs for a day's work, not records of work actually done. Few farmers will be able to carry out such programs to the minute or even to the half hour. That fact, however, does not lessen the value of the program in the least, in laying out work for the various members of the crew.

DAILY PROGRAM OF WORK ON A DAIRY FARM OF 160 ACRES (3 MEN)

4:45 A. M......Rise.
5:00– 6:30....Feed and milk cows.
6:30– 7:00....Care for other stock and prepare for breakfast.
7:00– 7:30....Breakfast.
7:30– 8:00....Clean barns, water stock, and get cows to pasture.
8:00–11:30....Field work { John, cultivate corn. Henry, hoe potatoes. Joe, hoe potatoes.
11:30–12:30....Water and care for stock, and get ready for dinner.
12:30– 1:00....Dinner.
1:00– 1:30....Rest.
1:30– 4:30....Field work. (See forenoon assignment. Joe get cows at 4:00.)
4:30– 6:00....Feed and care for cows and other stock. Milk.
6:00– 6:30....Supper.
6:30– 9:00....Recreation, reading, or social calls.
9:00..........Retire.

DAILY PROGRAM OF WORK FOR A 160-ACRE DIVERSIFIED FARM (2 MEN)

Summer Season—Good weather

4:45 A. M......Rise.
5:00– 6:20....Feed horses, hogs, and other livestock; clean and harness horses, milk cows; put barns in order.
6:20– 6:30....Prepare for breakfast.
6:30– 7:00....Breakfast.
7:00–11:30....Work in fields.
11:30–12:00....Return from fields, feed and water stock, prepare for dinner.
12:00–12:30....Dinner.
12:30– 1:00....Rest.
1:00– 5:00....Work in fields.
5:00– 6:00....Feed and care for stock and milk cows.
6:00– 6:30....Supper.
6:30– 9:00....Recreation; reading and social calls.
9:00..........Retire.

DAILY PROGRAM OF WORK FOR A 160-ACRE DIVERSIFIED FARM (2 MEN)

Summer Season—Rainy day

4:45 A. M......Rise.
5:00– 6:20....Feed horses, hogs, and other stock; curry horses, milk cows, and put barn in order.
6:20– 6:30....Prepare for breakfast.
6:30– 7:00....Breakfast.
7:00–11:30....Whitewash barn and poultry house.
11:30–12:00....Care for stock and prepare for dinner.
12:00–12:30....Dinner.
12:30– 1:00....Rest.
1:00– 5:00....Sharpen mower sickles and overhaul mower and hay rake.
5:00– 6:00....Feed and care for stock and milk cows.
6:00– 6:30....Supper.
6:30– 9:00....Reading or recreation.
9:00..........Retire.

Purchasing and Marketing

Storekeepers and merchants make their profits by buying at wholesale and selling at

retail. Farmers as a rule, reverse the process, buying at retail and selling at wholesale. It is in this respect that the independence of the farmer is often his downfall. Were it not for the fact that they buy but small quantities of commodities and produce nearly everything that they sell, this policy would be fatal to their business. Great improvement can be made by most farmers in their arrangements both for buying supplies and for selling their farm products.

Individual buying of supplies. In buying supplies, farmers as a rule deal with small retail stores in country towns. They buy in small quantities and often on time. Therefore they pay the highest price and oftentimes interest on the purchase, either directly or indirectly. A much better plan is to buy in large quantities, in unbroken lots, and for cash. There is no objection to dealing with the country storekeeper if he charges only a reasonable profit for his services as agent. It is wise always to watch the market and to learn what goods can be bought for in other places, and to stand ready to take advantage of bargains when offered. This is where a little ready cash held for operating expenses can be used to advantage.

Buying supplies coöperatively. Because an individual farmer needs only small quantities of most commodities that he buys, it is impossible for him to secure very low prices. The farmers in many sections are finding that by coöperation in securing supplies they are able to reduce the cost greatly. Goods bought in carload lots can be handled much more cheaply than when bought in small shipments, on which local freight must be paid. The farmers of a community can often join in the purchase of carload lots of bran, cottonseed meal, tankage, corn, or other feedstuffs. Fence wire, salt, cement, and other building material, also, may be purchased in the same way. Flour, sugar, and other household supplies may be included in the list in some communities, and where new supplies of livestock are to be introduced or a number of herd bulls are needed, coöperative buying and ownership has many advantages. Coöperative buying does not necessarily mean freezing out the retail dealer. When quotations for carlots of goods are wanted, the local dealer should be asked to figure on the order. If he can supply the goods at the same figure as a dealer farther away, he should be given the order. Often he can give considerable service in acting as the distributing agent and adjusting the bills between the purchasers. For such service he is entitled to get a commission or pay at some fixed rate. In any event, his goodwill should be retained as a member of the community, if he is fair-minded and square-dealing in other matters.

Selling the farm products. Few farmers market their products to the best advantage. Usually sales are made by the individual farmer when he has a product to sell or is in need of cash. In selling, but little attention is given to market fluctuations or to hunting for a market that will pay a special price for products of exceptional quality. He takes whatever he has to offer to a dealer at the local market, and takes what he can get for it. The reason for this is plain. The individual farmer can do but little to influence the market. He does not have enough of any product to market to affect prices materially. He seldom has enough to ship in large lots or in carloads to a better market. As a consequence, he is at the mercy of the local buyer. When there is no competition in the local market, the buyer has the advantage, but in most cases he pays all he can afford to for the quality of the goods offered. Good products marketed in small lots with poorer products are used to bring up the average of the shipment. The farmer who supplies the best goods does not always get their full value in selling on a noncompetitive market. Where staple products that are not perishable are to be marketed, the problem is not so serious, but without question study given to the problem of marketing would on most farms materially increase the net profit.

Whether the products are to be retailed direct to the consumer by the farmer or sold through a commission man, will depend upon the circumstances. Delivery to consumers in most cases requires special equipment and more time than the farmer can spare from the duties of growing the crop or making the product. In such cases it is best to leave the distribution to some one especially equipped for handling it and who can combine the products from many farmers, thus reducing the cost of distribution as a whole.

Careful preparation of the goods for market is an important factor in getting good values for them. It is not uncommon to find grain offered for sale which contains weed seeds, dirt, and other foreign matter. Such grain is subject to dockage and must be cleaned before it can be used. If the cleaning is left to the buyer, he must buy low enough so that he can afford to do the cleaning. In many cases, with special equipment he can do the cleaning more cheaply than the farmer can. The farmer should see, however, that he does not lose more than the cost of cleaning in selling his grain, and in growing grain, the aim should be to keep it free from weeds, keep out the dirt and foreign matter, and to produce only a product of good quality. A premium can be demanded for the best. If such goods are produced in sufficient quantities, shipment to a terminal market, when the local market refuses to pay full value, may be advisable.

Special preparation of all articles or produce should be given careful consideration. Good premiums are always paid for freshly gathered eggs, for attractively packaged but-

ter, and for cream of good quality. Special brands of hams, bacon, and other goods are often sold to advantage. Attractively dressed poultry can usually be sold at an advance over the common run. Berries, fruit, and potatoes require careful grading and shipment in attractive packages to bring the top of the market. Disease must be kept out and only good goods sent, if a market is to be permanently maintained. It is possible, of course, to fuss over the preparation of products so much as to raise the labor costs beyond the possible extra margin. Attention should be given to maintaining a regular supply and to keeping the goods up to a high standard. Nothing is more quickly fatal to a line of fancy trade than to disappoint shippers in either the expected arrival of goods or the quality of goods when they do arrive.

In selling livestock it is important to have the animals well grown and finished for the purpose of meeting a specific market. An animal in good flesh always sells better than one that shows poor care. This is especially true of horses and cattle. Attention should be given to having animals at the right age and weight when offered for the market, and the farmer who is looking for profits should avoid having animals grow old and unsalable on his hands. The individual farmer can improve the returns much by giving attention to producing the kind the market demands, to keeping his products up to a high standard of quality, to preparing them carefully and shipping them in packages suitable to the market, and by wisely selecting the best market for his goods. It is not possible for the individual to affect materially the market price for this produce. By joining his neighbors in the coöperative shipment of farm produce, frequently better prices can be secured. If the farmers of the community are to join in the shipment of their products, it is essential that they combine on the kind of a product to supply. The production of one variety of potatoes, onions, cabbages, and other vegetables will permit the shipment of carloads which are standard and which do not have to be regraded or broken up into small lots to sell to advantage. Selling, consequently, is more prompt and more likely to bring more satisfactory prices. Likewise community breeding of cattle or other kinds of livestock is a decided asset in selling the surplus stock. A community has no difficulty in attracting buyers from the outside who come because there is a large number of animals from which to make their selection. Neighborhood effort in breeding the best, in judicious advertising of the stock for sale, and in giving honest values can thus build a reputation for itself which will be reflected through the prosperity of the individual farmer. Coöperative livestock shipping associations in communities that are raising large quantities of meat stock are advisable. These insure the individual farmers getting their animals on the market with the fewest possible commissions and at the minimum cost for freight, commissions, and other services given. Many other examples of coöperation in buying and selling, and of individual effort in preparing the goods for market and placing them before the people, might be given. However, it is believed that these are sufficient to start those to thinking about the problem who are interested in improving their conditions.

Where individuals are obliged independently to find a market for their produce, consideration should be given to the merits of the parcels-post law, to express shipments, and various other methods of shipment which may permit placing the produce on the market promptly and in good condition. Light products of imperishable quality may very satisfactorily be marketed in this way, provided a line of customers can be found who are reliable and will pay a good price for the product.

FIG. 15. A farm is supported by its fertile, tillable acres. Most of this land is merely a burden that has to be carried by the rest of the farm

CHAPTER 2

Farm Records: How and Why They Should be Kept

By PROFESSOR ANDREW BOSS *(see Chapter 1). No one can run a farm like a business without keeping books and accounts in a businesslike way. A great many record-keeping systems fail, either because they are too complicated for the farmer to use or because they are so simple as to be incomplete and unable to indicate anything of importance regarding the business after they are kept. An elaborate system that gives excellent satisfaction on a large country estate, where an office force of clerks and accountants is maintained for that work alone, is not a farmer's system; it is useless to point to such a solution of his problems. Realizing this, Professor Boss has set out to tell just what a farmer should keep track of on paper, and how he can do it most easily and most effectively.*—EDITOR.

IF farming is to be done in a businesslike way, there must be systematic and efficient administration. To make this possible, it is necessary to know certain facts about the farm business. Ascertaining these facts implies the keeping of certain records. Business transactions on the modern farm are far too numerous to be kept track of accurately in one's head. A record of purchases and sales, as well as of debts and loans, may be simple and yet complete and orderly enough to show just what the farmer wants to know without much hunting. Inventories, labor records and other supplementary records are very desirable. Just what records each farmer should keep depends upon the amount and upon the type of business he is doing. The more complete and detailed the record is, the more it will show about the farm business. It will require more work to keep it also. In choosing a system of records, the fact should be recognized that the prime business of a farmer is raising crops and livestock, and not bookkeeping. The first requisite of any system of records is that it must record the essential facts. Only such facts as can be used should be included. It is confusing to have numerous accounts to which no attention is paid. Unless the records can be summarized as wanted through the year or at the end of the year, they are worse than useless and should be

INVENTORY LIST

Machinery	Value April 1st 1917		1918	
1 Separator	$ 30	00		
Utensils	5	00		
1 Set harness	24	50		
2 Sets heavy harness	40	00		
1 Single harness	14	00		
Collars, halters, etc.	10	00		
Manure spreader	100	00		
1 Buggy	14	00		
Robes, blankets, sacks, etc.	10	50		
Miscellaneous tools	25	00		
1 Tank heater	1	00		
1 Gas engine	40	00		
1 Wheelbarrow	2	00		
Disk	16	00		
1 Gang plow	19	50		
1 Breaking plow	7	00		
2 Drags	12	00		
2 Hay racks	11	00		
3 Wagons	42	00		
1 Corn binder	45	00		
2 Cultivators	60	00		
1 Binder	44	00		
1 Rake	13	50		
1 Mower	16	00		
Hay forks, slings and rope	12	00		
Total Machinery	$614	00		

FIG. 16. Sample page of an inventory, the most essential of the farm records

Cattle

Betsy	$ 50	00
Clara	70	00
Dell	85	00
Ethel	80	00
Fay	105	00
Gem	40	00
Henrietta	75	00
Ida	70	00
Jane	65	00
Kate	80	00
4 two-year-old heifers	160	00
6 yearling heifers	150	00
7 calves	56	00
1 bull	125	00
Total cattle	$1211	00

Miscellaneous

Household goods	$100	00
Supplies on hand	68	00
Wood, 15 cords @$5.50	82	50
Coal, 1½ tons @$6.10	9	15
Cash on hand	20	00
Cash in bank	420	00
Total miscellaneous	$699	65

Horses

Grey team	4 years	$350	00
Mare, Nell	6 "	100	00
Horse, Jack	5 "	125	00
Mare, Flora	8 "	80	00
Mare, Kit	10 "	70	00
Horse, General	10 "	60	00
Mare, Bess	1 "	90	00
Colt Nip		40	00
Total horses		$915	00

FIG. 17. Additional inventory pages. Values must be based on what the stock would bring at a sale, not on what they represent to the owner.

dispensed with. One should carefully study the question of what he wishes to know about his business, and then plan records, methods of keeping them, and a system of summarizing which will give him the knowledge he desires about his business. In this way, the records can be made useful in making an analysis of the business, in enabling the farmer to eliminate wasteful processes, and to discontinue the production of products which cause him a loss. If one organizes his system of records with the idea of learning where the gains and losses of the business lie and of using other useful information, there will be no question about the value of farm records. As mentioned, there is a large number of records which may be kept. Since the nature of the business of farming calls for much out-of-door employment, and leaves but little time for office or clerical work, it is essential that the accounts be as simple as possible.

The records may be classified as follows: *Essential records:* Inventory and cash account records. *Supplementary records:* Production records, labor records, feeding records, crop records, breeding records, etc.

Essential Records

The inventory. The most essential farm record is the inventory. Once each year, everything of value on the farm should be listed with a value affixed. Without this most necessary record no farmer can tell how big his business is nor whether he is paying or being paid for running his farm. Cash on hand is no indication of his prosperity, because his livestock or machinery may have so increased as to make a nice profit during the year, and yet his bank account may be overdrawn. An annual inventory, too, gives a means of checking up on small tools and other property that may have been lost during the year. It will not take more than half a day once a year to take an inventory of the ordinary farm. Its value is far in excess of the cost of getting it.

How to take an inventory. It is best to take the inventory about March or April first on the ordinary farm, as at that time supplies of feed and salable stock are usually lowest, and there is less to inventory than at any other time. It may be taken, however, at any convenient time. It is important that the inventory be taken at the same time each year so as to include just a year's business. A value should be placed on the land and buildings separately as a start of the inventory. Unless extensive improvements have been made, the values should be the same at both ends of the year. If there has been an in-

Poultry and Bees

100 hens	@ 60¢	$ 60	00
4 roosters	@$1.00	4	00
6 geese	@$1 50	9	00
2 turkeys	@$1.50	3	00
6 hives of bees	@$6.00	36	00
Total poultry and bees		$112	00

Hogs and Sheep

Hogs			
10 sows	2800 lb. @ 15¢	$420	00
1 boar		50	00
Total hogs		$470	00
Sheep			
50 ewes	@$12 00	$600	00
2 rams		40	00
Total sheep		$640	00

Feed and Supplies

Oats in horse barn	61 bu @ 55¢	$ 33	55
Oats in granary	215 bu @ 55¢	118	25
Barley	391 bu. @$1.15	449	65
Corn in crib	200 bu. @$1.60	320	00
Corn in barn	25 bu @$1.60	40	00
Seed corn	8 bu @$5 00	40	00
Clover hay	50 tons @$16 00	800	00
Silage	40 tons @$ 4.00	160	00
Oil meal	5 tons @$54.00	270	00
Tankage	1 ton @$65.00	65	00
Work medicine for hogs		2	00
Total feed and supplies		$2298	45

Fig. 18. Early spring is a good time to take an inventory, because then the supply of feeds, etc., is likely to be at its lowest point.

crease in value, add the increase to the net worth and include it with the opening of the next year's business. After listing the land and buildings, one of the best ways to take an inventory is to rule up some sheets of paper as shown in Figure 16, and with a supply of these go out to the barn and around the farm, listing and setting a price on everything of value, classifying the items roughly, if convenient. Everything inventoried should be put down in groups, so that it is easy to find the total value of each group, such as horses, feed, or other items of special interest. List livestock not at what it *might* sell for, but at what it would bring at a forced sale or on the established market. It should not be priced too high. In listing machinery, put it in at what it would bring at a sale, not what it would cost to replace it. Measure or weigh all feed. Put in salable feed at the market price less the cost of hauling to town; purchased feeds at the purchase price plus the cost of hauling. When everything has been listed on the blank sheets, the totals may be entered on a form such as is shown in Figure 19. A summarized inventory of this kind will tell whether the business is worth more or less at the end of the year than at the beginning, and how much, but it will not tell where the gain or loss was made. It shows no record of how much cream was sold or how much feed was bought for the cows or other stock, nor of the details of the sales and purchases. This information must be gained from the cash account.

Cash account. The cash account is another essential record. In recording the cash "spent" or "taken in" as a whole, it may be entered on 2 pages of a book ruled as in Figures 20*a* and *b*. This is the most simple form of cash record. It will tell how much was taken in and paid out during the year. If one wishes to know how much revenue the cows produced, he can go through and pick out those items such as "Cream check," "Sold Jane to Smith," etc., and by setting them

SUMMARIZED INVENTORY

Farm of H. P. White

		Value April 1st 1917		1918	
Land	320 acres @ $75 00	$24000	00		
Buildings					
House		2,500	00		
Horse barn		1,000	00		
Dairy barn and silo		2,300	00		
Machine shed and tool house		400	00		
Hog house and corn crib		500	00		
Horses		915	00		
Cattle		1,215	00		
Hogs		470	00		
Sheep		640	00		
Poultry and Bees		112	00		
Feed and Supplies		2,298	45		
Machinery		614	00		
Miscellaneous		699	65		
Bills others owe me		150	00		
Total Investment	$	37,810	10		
Bills I owe		8,246	15		
My net worth	$	29,563	95		
Increase in inventory over last year		$ 652	00		
Increase in land value if any		800	00		
Total increase for year		$1,452	00		

Fig. 19. The summarized inventory shows just how much more or less the farm is worth than it was in the previous year, without reference to any business done during the twelve months.

down separately, may determine the income from cows. In the same way the expense of keeping the cows may be found. This plan is troublesome, however, and not nearly so satisfactory as the distributed cash record, which can be easily summarized.

The distributed cash record. This form of record requires a little more time to make the entries for each day's transactions, but it saves time in summarizing the records and tells much more about the farm business. In keeping this record, the items are described in a wide column at the left side of the book. The total cash receipt or expenditure should be entered in the first column to the right of the description. As many additional columns may be used as there are classes of stock or products for which a record is desired. If cows are the only thing one cares to keep special track of, only 2 columns are necessary, one for total expense and one for cows. Many farmers will want to keep a record of several enterprises. They may have columns for just as many as they have room for. Figs. 21*a* and *b* show a list of such enterprises. If it is desired to keep track of each crop, each may have a column. Labor, machinery, equipment, permanent improvements, etc. may be separated out in the same way.

The more enterprises into which the cash

1917 **RECEIPTS**

Apr	2	Cream check	$35	26
	7	Sold a calf, 140 lbs. @ $13.50	18	90
May	9	Sold 100 bu. corn @ 1 60	160	00
		Traded 10 doz. eggs @ 26¢	2	60
June	1	Cream check	40	15
		John Jones paid me for hogs	150	00
		Borrowed at Bank	50	00
	4	Sold Kit to Hanson	75	00
		Cream check	45	19
	14	Sold Jane to Smith	75	00
July	6	Cream check	50	12
Aug	10	Cream check	40	74
Sept	8	Cream check	32	96
	10	Sold heifer to Smith	45	00
	18	Helped Hanson fill silo – 2 teams	10	00
Oct	7	Cream check	37	18
		Sold chickens – 200 lbs. @ 18¢	36	00
Nov	12	Cream check	43	57
		Sold 60 hogs – 19200 lbs. @ 18¢	3456	00
	18	Sold 20 lambs – 2500 lbs. @ 16¢	400	00
		Forwarded to next page	4803	67

FIG. 20*a*. Left-hand page of the cash account book, which is the easiest daily record to keep, but the hardest from which to get any definite, summarised facts.

RECEIPTS

		Total Cash	Horses	Cattle	Hogs	Sheep	Bees & Poultry	Crops	Misc.
April 2,	Cream check	$ 35 26	$	$ 35 26	$	$	$	$	$
7,	Sold a calf #140 @ $13.50	18 90		18 90					
May 9,	Sold 100 bu. corn @ $ 1.60	160 00						160 00	
	Traded 10 doz. eggs @ 26¢	2 60					2 60		
June 1,	Cream check	40 15		40 15					
	John Jones paid for hogs	150 00			150 00				
	Borrowed at bank	50 00							50 00
4,	Sold Kit to Hanson	75 00	75 00						
	Cream check	45 19		45 19					
14,	Sold Jane to Smith	75 00		75 00					
July 6,	Cream check	50 12		50 12					
Aug 10,	Cream check	40 74		40 74					
Sept. 8,	Cream check	32 96		32 96					
10,	Sold heifer to Smith	45 00		45 00					
18,	Helped Hanson fill silo 2 teams	10 00							10 00
Oct 7,	Cream check	37 18		37 18					
	Sold chickens, #200 @ 18¢	36 00					36 00		
Nov 12,	Cream check.	43 57		43 57					
	Sold 60 hogs, #19,200 @ 18¢	3456 00			3456 00				
18	Sold 20 lambs, #2,500 @ 16¢	400 00				400 00			
	Sold 4 doz. eggs @ 30¢	1 20					1 20		
21	Sold the bay colt	85 00	85 00						
	Sold 4 tons hay @ $15.00	60 00						60 00	
Dec 5	Cream check	48 92		48 92					
8	Sold 64 bu. oats @ 60¢	38 40						38 40	
	Forwarded to next page $	5637 19	160 00	512 99	3606 00	400 00	39 80	258 40	60 00

FIG. 21*a*. Left-hand page of a typical distributed cash record. The extra minutes spent in keeping it are more than balanced by the increased information it supplies at a glance at any time

1917 **EXPENSES**

Apr.	2	Groceries	$6	50
		Horse brushes	1	00
		Personal	6	15
	7	Machine oil		70
		Lumber	3	15
		Clover seed #80	18	65
		Eggs for hatching	3	00
	9	Groceries (bought with eggs)	2	60
		Salt for cows	1	65
		Medicine for hogs	1	00
		Bee supplies	6	00
	14	Personal	2	14
		Groceries	3	46
May	2	Groceries	4	76
		Dairy utensils		50
		Screenings for sheep #2070	6	21
		Grinding feed	2	00
		Colt service	15	00
		Real estate taxes	36	40
June	1	Paid Cameron Bros on account	300	00
		Forwarded to next page	420	87

FIG. 20*b*. Right-hand page of the cash account book. Aside from the necessity of having such a record, it is an excellent thing to get into the habit of keeping it.

account is divided, the more work it is to keep the records. It is better to have a few accounts kept right than a large number kept for a month or two and then abandoned as too much work. It is essential that entries in the books be made daily; for, if the bookkeeper once gets behind, it is almost impossible to catch up. It is a good plan to keep the book near the dining-room table and enter the accounts every night before leaving the supper table. It takes only a very few minutes, and in this way it is pretty sure to be done. The transactions are fresh in mind, also, and can be more accurately entered. It is easy to see then how a cash record kept by this method, called the single-entry system, can be made simple or complex according to the number of separate accounts kept. If so many enterprises are listed separately that there is not room for them on one page, they may be extended across both pages. In order to keep a year's record of each together, several pages should be left for "Receipts" and in another place several more pages for "Expenses."

In order to find out how each enterprise has come out financially, it is only necessary to add up each column. To learn the true earnings of the enterprise, add the opening inventory of the enterprise, to the expense side and the closing inventory to the receipts side. The difference between the two footings will show whether or not the receipts exceed the expense. If so, this may be counted as gain. If the total receipts do not

EXPENSES

	Total Cash	Horses	Cattle	Hogs	Sheep	Crops	Personal & Household	General Expense
Apr. 2, Groceries, personal & horse brushes	$ 13 65	$ 1 00	$	$	$	$	$ 12 65	$
7, Machine oil 70 Lumber 3.15	25 50							3 85
Clover seed #80						18 65		
Eggs for hatching								3 00
9, Groceries (bot with eggs) from Jones	2 60						2 60	
Salt for cows	1 65		1 65					
Medicine for hogs	1 00			1 00				
Bee supplies from S.R. & Co.	6 00							6 00
14, Personal	2 14						2 14	
Groceries, Powers Co.	3 46						3 46	
May 2, Groceries from Jones	4 76						4 76	
Milk pail	50							50
Screens for sheep #2070	6 21				6 21			
Grinding feed for hogs	2 00			2 00				
Colt—Service fee Joe Carey	15 00	15 00						
Real estate taxes	36 40							36 40
June 1, Cameron Bros on acct. Machinery	300 00							300 00
Groceries Jones	4 87						4 87	
8, Cultivator repaired	5 00							5 00
Nails	50							50
30, Gasoline	2 00							2 00
Pump repaired by Ed. Smith	70							70
Forwarded to next page	$ 433 94	16 00	1 65	3 00	6 21	18 65	30 48	357 95

FIG. 21*b*. Expense page of the distributed cash record. While the difference between the right- and left-hand columns for any one department indicates how it is progressing, its real financial condition is found only by adding or subtracting the increase or decrease in value as shown by the inventory.

LEDGER CATTLE ACCOUNT

Outgo					Income				
Apr	1	Inventory	$ 1211	00	Apr	2	Cream check	$ 35	26
	9	Salt for all	1	65		7	Sold calf	18	90
July	12	Bought cow from Thomas	95	00			#140 @ $13.50		
	14	Put 30 tons clover hay			June	1	Cream check	40	15
		in barn	480	00		4	Cream check	45	19
Aug	15	Veterinary for Ethel	5	00		14	Sold Jane to Smith	75	00
Sep	28	5 mos. pasture charge	63	75	July	6	Cream check	50	12
Oct	3	Cost of filling silo	62	15	Oct	1	Sold 5 fat cattle	571	95
	7	10 tons middlings					#6150 @ $9.30 cwt		
		@$40	400	00	Dec	31	Inventory	1,700	00
Dec	31	Net profit	218	02				$ 2,536	57
			$ 2536	57					

FIG. 22. Sample page from a double-entry farm-record system. This has the disadvantage of requiring two notations, on different pages, for each item; but it is the surest method for finding which departments of the farm are paying and which are losing, and how much.

exceed the expense, there has been a loss. Any new stock, equipment, or produce will show as so much cash returned by that enterprise. Thus, suppose that receipts from cattle were $600 and expenses for the year $850. This would look like a loss on cattle, unless we added to it the fact that the cattle were worth $1,211 at the beginning of the year, and $2,200 at the close. The profit of $739 on that enterprise is found in the barn instead of in the bank.

The double-entry system. Some farmers who have kept the simpler forms of records successfully may want to trace out more carefully still the sources of profit and loss. In the single-entry system described, nothing except the inventory was taken into consideration unless it was a cash transaction. The cattle were not charged for the hay they ate. Cattle may have shown a profit, while, if they had been charged with the feed they ate, the labor put on them, the cost of keeping a barn to shelter them and the money that would have come in as interest if the cattle had been sold and the money put in the bank, they would have shown a loss. To keep track of these exchanges which do not use any money, a double-entry or ledger system is better adapted. The double-entry system involves the use of a *daybook*, also called a *journal*, in which are recorded all of the transactions as they occur. These may include cash purchases or sales, or the delivery of hay, corn, or other feed from a certain field to a certain class of livestock. From the journal these records are posted to ledger accounts with the various crops or enterprises about which it is wished to know the details of profit. A sample ledger page is shown in Figure 22. The difference between the "*Income*" and "*Outgo*", plus or minus the difference in *Inventory*, should show the profit made or the loss sustained on each account.

The double-entry system may be made simple or difficult, according to the number of separate accounts that are kept. It gives a much better idea of just where the profit or loss occurred than does the single-entry system, but does not tell any better the profit or loss from the business as a whole. It requires labor records for men and horses to get the actual costs on crops, livestock, etc., and this makes more figuring than most farmers are willing to do. For this reason the double-entry system is not recommended for general farm use except by those who wish to go into details. Where the farm is large enough to employ a bookkeeper, the double-entry system is by far the best. For a detailed discussion of this system, see Prof. G. F. Warren's "Farm Management" or any good text on bookkeeping.

Supplementary Records

The foregoing records are considered essential to the businesslike management of a farm. From studying and summarizing these records it is possible to learn whether or not the farm as a whole has paid a profit. Production

MILK AND FEED RECORD

THIS SHEET IS PLANNED TO BE USED AS A WEEKLY RECORD WHEN EVERY MILKING IS WEIGHED. IT MAY BE USED AS A MONTHLY RECORD IF ONLY OCCASIONAL MILKINGS ARE WEIGHED, AS INDICATED IN NOTE BELOW.

HERD OF.................................. FROM.................19...., TO.................19....

COW-NAME AND NUMBER		1		2		3		4		5		6		7		8		9		10		REMARKS.
DATE		lbs	ths 10	lbs.	ths 10	lbs.	ths 10	lbs	ths 10	lbs	ths 10	lbs.	ths 10	lbs	ths 10	lbs.	ths 10	lbs.	ths 10	lbs.	ths 10	
	A.M.																					
	P.M.																					
TOTAL																						
GRAIN																						
ROUGHAGE																						

		Parts in Mixture	Price	Kinds of Roughage	Price
Kinds of Grain Fed.					
	Ave. price per lb.				

IF MILK IS NOT WEIGHED EVERY MILKING WEIGH AT LEAST MORNING AND EVENING ON THE 1st, 10th AND 20th OF EACH MONTH.
AN INDIVIDUAL COW RECORD FOR BOTH THE MONTHLY AND YEARLY SUMMARY IN PAMPHLET FORM IS USED WITH THIS SHEET

FIG. 23. Monthly combined feed and milk record (centre omitted to save space) for a farm where dairying is an important activity

records and others are desirable for a more complete knowledge of the details of management. A discussion of some of these follows.

Milk record. If a farmer is specializing in any line of work such as dairying, he may be especially anxious to know just what his cows are doing. He may then keep special records to show what he wants to know. If production is what he wants, he may use a weekly milk sheet like that shown in Figure 23. This form also allows room for a feed record. From this it is simple to figure the feed cost and the value of produce from each cow or from the herd. This will not include labor, shelter cost, bull, veterinary, and interest charges, which must be kept track of or estimated to find just what profits are being made from each cow. It has been found from experience that a morning and an evening milk record, taken twice or three times a month, will give almost as accurate results as when taken every day. The trouble is, it is likely to be forgotten or neglected. It is best to weigh the milk from each cow regularly night and morning. Once or twice a month is often enough to test the milk of each cow for butter-fat content.

Egg record. An egg record is easily kept, if a form something like Figure 24 is tacked up in the kitchen or the poultry house and a pencil kept handy, so that the number of eggs

EGG PRODUCTION RECORD

Av. no. Hens													
DATE	JAN.	FEB.	MAR.	APR.	MAY.	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	REMARKS
1													
2													
3													
31													
Total													
Avg. Per Hen													

FIG. 24. An egg record, carefully kept, is as necessary in weeding out poor layers as is the Babcock test in weeding out boarder cows

REGULAR WORKERS DAILY TIME SHEET

Day of Week *Monday* Date *Sept. 24, 1917*

Time	KIND OF WORK	No. Loads	Field	Man Hours	Horse No.	Horse Hours
4.30						
5.00	Feeding horses			½		
5.30						
6.00	Milking			1		
6.30	Breakfast					
7.00	Cleaning barn			½		
7.30						
8.00–9.30	Hauling green corn for cows	2	B	1½	2	3
10.00–11.30	Plowing		D	2½	5	12½
12.00	Watering stock			½		
12.30	Dinner					
1.00	Rest					
1.30–5.00	Hauling manure	5	C	4	3	15
5.30	Milking					
6.00						
6.30	Feeding & care of horses			1		
7.00	Care of hogs & calves			½		
7.30						
8.00	Supper					
8.30						

Workman *Elmer Harrison* Total Hours *13* *30½*
Remarks Report OK *E.T.*

FIG. 25. To know the actual cost of a crop we must know how much labor was expended in raising it. A record like this tells the story.

gathered each day can be marked down as they are brought in.

Labor records. A labor record, showing the hours put in by men and horses on each crop, the livestock, or other enterprises, is of great value, if one wishes to study the cost of producing his products. It is convenient also as a record of where labor has been used, even though it may not be used to determine the cost of production. Several forms for keeping labor records have been devised. The best one to use depends much on what is to be done with it finally. One of the most popular is the diary form of record shown in Figure 25. In using this form each laborer or hand puts down daily the time he has expended on various enterprises. The record is divided into one-fourth hour periods so that an accurate division can be made. This form is quite useful in stimulating interest in the work when once started, and keeping the record has a tendency to induce each laborer to make better use of his time, especially if it is to be reviewed by his employer or a foreman. In making use of this sort of a record it is necessary to pick out the items charged up against any particular field or product to learn how much time in all has been required. This is a laborious process and seldom done except by a clerk or bookkeeper.

Another form that has the advantage of distributing the time as

MONTHLY FEED RECORD Month *April*

	HORSES			COWS			HOGS				POULTRY	
Kind of feed	Hay	Corn	Oats	Hay	Silage	Shorts	Corn	Skim milk			Grain	
Avc lbs. daily per head	15	6	8	20	30	6	3	4			.1	
Number days fed	30	30	30	30	30	30	30	30			30	
Total lbs. per head	450	180	240	600	900	180	90	120			3	
Avc. no. head fed	5	5	5	12	12	12	18	18			140	
Total lbs. per month	2250	900	1200	7200	10800	2160	1620	2160			420	
Price per lb. or bu	½¢	1½¢	2¢	½¢	Ton $3.00	2¢	1½¢	¼¢			1½¢	
Value of feed $	11.25	13.50	24.00	36.00	16.20	43.20	24.30	5.40			6.30	

Remarks *Hay is mixed clover and timothy*
Grain for chickens is 4 parts corn, 4 parts wheat screenings, 4 parts buckwheat

FIG. 26. Sample columns from a monthly feed record. Without a series of such reports for each department, an accurate knowledge of the whole farm enterprise is impossible.

When the problem of how best to grow the crop ends, then begins the problem of how best to dispose of it

Marketing takes time that might be given to crops or stock. The purpose of the middleman is to do it quicker, better, and more cheaply than the farmer can

PRODUCTION IS BUT HALF OF THE FARMER'S BUSINESS; NOT UNTIL HE HAS MARKETED WHAT HE HAS RAISED CAN HE BEGIN TO LOOK FOR PROFITS

Industry | Independence | Patience

AMONG THE QUALITIES THAT A GOOD FARMER MUST POSSESS, THESE THREE STAND SUPREME: THE WILL AND POWER TO WORK; THE VIRTUE OF STANDING ON ONE'S OWN FEET; AND THE ABILITY TO WAIT FOR AND ACCEPT GRACEFULLY WHATEVER NATURE HAS TO OFFER

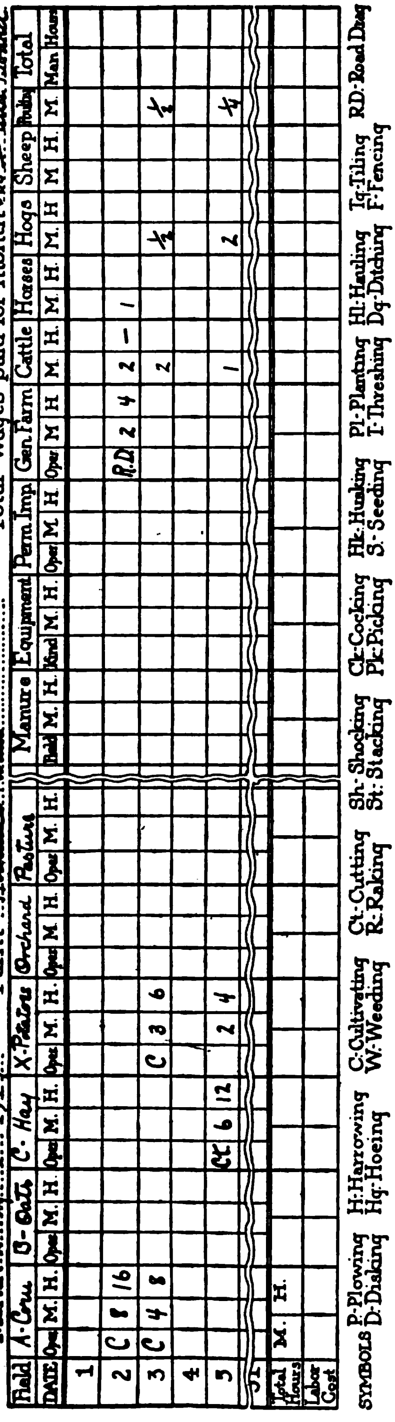


FIG. 27. A record of this kind must be planned to meet the needs of the particular farm. It is most accurate if kept by the owner or foreman from weekly data supplied by the hired hands

entered, is shown in the monthly report (Figure 27). One of these blanks can be given to each hand with the requirement that he keep the record, or better, one can be kept for each hand by the farmer or foreman. It will be noted that there are blank columns in which can be written the names of the fields and crops, or of special classes of livestock. There are also columns for general farm expense and other charges. The price paid for the labor should be entered in the upper right-hand corner where space is provided. To make the record more complete, the operations are shown on the left margin with suitable abbreviations. The abbreviations may be entered in the first column for each enterprise in explanation of the work done. This form of report saves hunting for time charges and saves turning over pages to find the enterprise. The monthly reports may be summarized as completed and all brought into a final summary at the end of the year. There is a good deal of work in keeping an accurate labor record, and it is advised only when specific use is to be made of it.

Feeding record. An approximate record of food consumed is very desirable, if not actually necessary, in determining the profits from any class of livestock. While it is possible to estimate from feeds purchased and grown, less the amount on hand, about what feedstuffs have been consumed, the estimate does not show accurately the distribution of feed. A simple feed record in which the amounts used by the different classes of animals is entered, is advised if a true knowledge of the results is desired.

A feeding record may be taken in two ways. One is to weigh up the feed given each animal once a week, or once a month, and then get the number of days fed and the number of animals it was fed to. In this way, the feed for the month can be very closely calculated. Figure 26 shows a monthly record of this kind. A yearly summary can easily be made from the monthly records. The other way is to charge the feed in bulk. For instance, if 10 tons of hay and 200 bushels of oats are put in the horse barn for horse feed, make one charge for it, and nothing further need be done until they are gone. Whichever way is the most convenient is the one to use.

Crop record. A crop record is not hard to keep, and is of value in comparing yields and values in succeeding years. The record may be more or less complete than the one shown in Figure 30, depending on what the farmer wants to know. It may be made to include depth and time of plowing, depth and time of seeding, time of harvest, weather conditions, etc., or it may be cut down to seed sown and crop harvested.

Breeding record. A breeding record is almost a necessity on the stock farm. A card catalogue is a convenient form for purebred stock, each breeding animal having a card on

SWINE

Name *Princess x* No. *21726* Tag *DJL 22*
Date Farrowed *Apr. 26* No. in litter *7* Sex *4B-3S.*
Description *Black except on feet and nose. Ear notched*

		Year	Inv. Val.	Val. Pigs	Cost	Profit
Sire *Big Prince* 19763	*Prince George* 18271	1914	50^{00}	207^{00}	123^{00}	84^{00}
	Big Susie					
Dam *Dutchess x* 20122	*Duke Alex* 19241					
	Dutchess A 18962					

Remarks

BREEDING RECORDS PIGS

Year	Boar	Date Farrow	Sex	Disposition	Value
1914	Big Bowe Jr.	Apr. 2	M	Sold for Pork	22^{00}
			F	" " "	20^{00}
			F	Kept for Brood Sow	40^{00}
			F	" " " "	35^{00}
			F	Sold to Frank White	40^{00}
			M	Sold to Eli Duke	50^{00}
			M	Died	—

FIG. 28. Two sides of a card on which the complete history of a pig can be kept. Such a record is indispensable in pure bred operations

which the date of birth, description, etc., are given, and room left for the date when bred, sire used, and date young are born. In the case of hogs and sheep, it is also important to know the number of young produced and the sex. The card index (Fig. 28) makes the comparison of records easy, but means more work than some variation of the form shown in Figure 29.

In discussing farm records no attempt has been made to show all of the different forms of records that may be used. Only those essential to recording and interpreting a simple farm business have been included; they can be adapted to many different kinds of farms and will prove useful and as simple as any. With the farmer it is less a question of having every

BREEDING RECORD YEAR *1917*

Mares	Cows	Sheep	Hogs	Sire Used	Date Bred	Date Due	Dropped Young	Sex
Nell				Bismark	Apr. 2	1918 Mar. 7	Mar 9	M
	Belle			Beaumont	Nov. 1	July 9	July. 7	M
		No. 72		Mac	Nov. 5	Apr. 4	Apr. 4	2 F
			No 14	Pride	Mar 1	Jun. 22	June 23	3 M 5 F

FIG. 29. A breeding record with which the activities of all the livestock departments can be kept on a single sheet

Farm of *Geo. White*
Crop *Oats* Field *B* Acres *17.6*
Amount seed *44 bu.* Per acre *2 1/2 bu.* Value @ *.90 $39.60*
" Twine *40#* Per acre *2 1/2 #* Value @ *.13 - $4.40*
Grass seed sown *Red clover* Amount *102 #*
Value *$20.40* Threshing cost — Per bu. *4¢*
Yield: Machine measure *852 bus.*
Weight ______ , Tons ______
By-product *21 tons straw (est.)*

FIG. 30. Sample crop-record card that supplies both a record of past accomplishments and a basis for future plans

Type	Records Kept	Results Obtained
I Elementary	1. Inventory	Shows increase or decrease in capital which shows personal gain or loss.
II Simple	1. Inventory 2. Financial Accounts	1. Increase or decrease in capital. 2. Farm profit or loss. 3. Household and personal expense. 4. Distribution of receipts and expenses. 5. Farmer's labor income.
III Complex	1. Inventories 2. Financial Accounts 3. Labor Records 4. Livestock and feed, production records 5. Supplementary notes to 3 and 4.	1. Increase or decrease in capital. 2. Farm profit or loss. 3. Household and personal expense. 4. Distribution of receipts and expenses. 5. Farmer's labor income. 6. Exact distribution of cost. 7. Exact distribution of income. 8. Cost, income, and profit of each group of live-stock. 9. Cost, income, and profit of each field crop.

cash, feed, and labor charge accurately entered than of having a correct knowledge of the year's business. Many of his accounts are with crops and stock instead of with men, and a few dollars apparent loss on crops and gain on his stock does not affect the profits from his farm, even though it may not be quite fair to his crops.

For the benefit of those who want a comprehensive method of record keeping, we reproduce above an outline taken from Farmers' Bulletin 511, U. S. Department of Agriculture, Washington, D. C., which may be obtained on request. Prepared forms for almost any style of record may be purchased from publishers and bookstores.

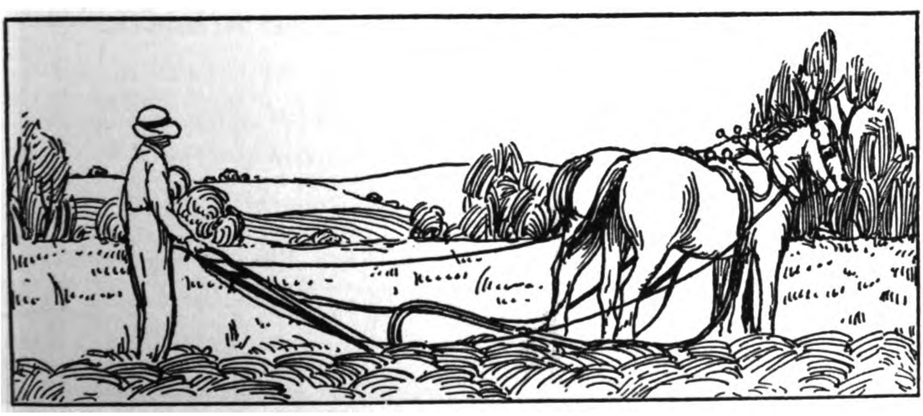


FIG. 31. It has been found that where it cost $2 per acre to plow this way, it cost $1.25 per acre when a three-horse, two-furrow plow was used. Careful records of such data as this are essential features of successful business-farming

CHAPTER 3

The Farmer and His Money

By Samuel D. Gromer, *Professor of Rural Economics of the College of Agriculture of the University of Missouri; a man who knows the scientific side of the subject, but who, as owner and operator of a successful farm, knows also its practical applications and everyday problems.*

The farmer of yesterday was so aloof from the usual activities of business and commerce that his need of money and his knowledge of the principles under which it is made and used were relatively slight. He dealt but little with the outside world; most of his transactions were in the nature of barter or simple exchange of goods; and, since his neighbors were in the same condition as himself, there was as little opportunity as there was need for him to borrow cash. Later came new sources of money and new needs, and on their heels, mortgages and other results of borrowing. But the farmer learned the ways of finance, if at all, by sad experience rather than as a part of his education designed to prepare him for the management of his affairs.

The farmer of to-day, being a full-fledged business man, and carrying on an industry as complex and diverse as that of any merchant or manufacturer, must have a fuller knowledge of these things; he must know not only how to make, keep, and use his money, but also just what it stands for, what determines its value and purchasing power, what relation it holds to other factors in the affairs of men and the nation. It is these somewhat unfamiliar but highly important matters that Professor Gromer discusses.—Editor.

FARMERS are more directly interested in money—what it is, what it does, and what it can do—and how they can make the best use of it than are any other group of producers.

Production is carried on primarily for exchange, for the market, for the value of the product to others, and not for any utility it may possess for the producer. He does not intend to consume it. Without exchange what would the farmer do with his surplus livestock, grain, and other farm products? To facilitate exchange a medium of some sort is necessary.

Different articles, such as shells, tobacco, etc., have been used for this purpose, but finally all have been ousted by the precious metals—gold, silver, and copper. Now gold has come to be the chief medium of exchange in civilized countries. This is due to its possession of 2 properties which enable it to fulfill its function better than any other object, namely, facility of transport and durability. It contains great value in small bulk and is chemically unalterable. Its value varies but little from place to place and from one time to another. This medium of exchange is denominated money, and by means of it all desired or needed objects may be reduced to a common denominator and added, subtracted, measured, and compared directly without the difficulties involved in barter.

Our standard of value is the dollar containing 25.8 grains of gold, nine tenths fine. Our gold coins would be undiminished in value, were they melted into bullion. This is not true of our other metallic money, and our paper money is practically worthless as paper. The American gold dollar is a type of a perfect money, but not so our other moneys. The latter depend more or less for their value on the belief that they can be exchanged for gold. If issued in such amounts that the public would lose confidence in its being able to exchange them for gold, they would fall in value.

The money of our country (not considering the hoard in the treasury) may be divided into 2 parts: (1) money in circulation and (2) money in banks, the two being approximately equal. The money in circulation consists of all money used in payment for goods purchased and is in the pockets and purses of the people and in the tills of the merchants. The cash in the banks, or reserve, as it is called by the bankers, is used by them to make certain the payment of deposits as they are demanded by depositors. Much of the deposits have been loaned, and these loans are based on the property of the borrowers. The borrowing property owner has only to deposit what he borrowed, on which he has a right to draw checks, and his comparatively unexchangeable property circulates and performs the function of money. In our country the bank deposits are about 5 times as large as the banks' cash or reserves, and circulate more than 3 times as fast as money.

Farming conditions after the Civil War. The farmer's business has not been overremunerative. Following the Civil War the liberal policy of the government with reference to the public lands made it possible for anyone with the ordinary industry of the farmer to secure a farm. The land was fertile and abundant, in a climate well suited to the white race, and with resources peculiarly suitable for its occupation by a hardy people. Many persons took advantage of this opportunity, including thousands of men who had fought in the Civil War and numerous immigrants from Europe. The fertility of the soil was the accumulation of ages undisturbed by man; the area open to settlement was as large as half of Europe. This period was marked by the invention of labor-saving machinery, such as the reaper, mower, cultivator, steel plow, and the corn planter, by means of which farming could be carried on with much less man power.

Such favorable conditions for the production of large amounts of agricultural products in proportion to the population had never been known before and probably never will be known again. Their result was an excess of agricultural products. Corn sold for a few cents a bushel; chickens as low as 75 cents a dozen; hogs for 2 cents a pound; horses and cattle could be had for a song. Many vegetables were so plentiful that they rotted in the fields and gardens. Land was cheap in many places, even though there was no public land near. Late in the seventies a man rigged up a covered wagon outfit and left the rich prairie region of northwest Missouri, where unimproved land was worth $5 per acre, to go to northeastern Kansas, where similarly fertile land was worth $2.50 per acre. There was no money in farming. The settlers understood this. They were unable to make money out of their crops, but they were making farms.

The consumer in the city got his food at unheard-of low prices. He became used to such prices, and now he seems to think that they are his by right. He has failed to appreciate the economic and social changes that have taken place—exhaustion of the public domain, an increased population, and the growth of monopolies. Cheap agricultural products have probably disappeared forever.

The uncontrolled forces of nature are a prime factor in determining the amount and quality of farm products. If nature acts kindly toward the farmer and he produces bumper crops, there is likely to be such an abundance as to impoverish him; while, on the other hand, if nature acts niggardly and his crops are smaller than the average, while he may profit financially, the consumer is impoverished and the cry at once goes up that the farmer is getting rich; that the single tax should be put in operation against him to take care of the so-called unearned increment, and that the price of his products should be fixed by law. Superficial thinking carries the day. The true principles governing the situation are either not understood or are cast aside as trash.

Gregory King's law. When we stop to think it over, it is easy to understand that the amount of food required, or that can be consumed, to satisfy the body's want, is strictly limited in amount. If the farmer pro-

duces more wheat than is normally required to appease all appetites, the price falls out of all proportion to the amount of excess; similarly, if he fails to produce enough, the price rises. A scale of ratios governing the increase or decrease of amount and the resulting increase or decrease in price was worked out by Gregory King several hundred years ago. It showed that an increase or decrease of 0.1 on an article of prime necessity, as such wheat product, lowers or raises the price 0.3; that an increase or decrease of 0.3 in product affects the price 1.6; that a 0.5 increase or decrease in product makes a difference of 4.5 in price, and so on. The application of Gregory King's law to the world shortage of agricultural products in 1916 and 1917, the enormous increase in our circulating medium and the consequent cheapening of the dollar, and the increased demand due to the war, easily account for the world's high prices.

The farmer and farming statistics. It is highly important that the farmer should have a comprehensive knowledge of the amount of the world's output of agricultural products, the world's probable demand for them, and the subsequent price at which these products will probably be consumed, based on the law of supply and demand. If the United States Department of Agriculture could furnish this information promptly and in simple form, it would render the farmer an enormous service. It was a lack of this information, and of even a reasonable approach to it, that caused the farmer to sell his wheat for around $1 in 1916, whereas later it sold for considerably more than $3, and to sell his corn for around 75 cents, whereas a few months later it reached a price on the farm of more than $2 per bushel.

The best of our land suited for grain is already in cultivation and much of it is badly worn. Prices have been so low that the farmer has not been able to maintain the fertility of the soil. While it is true that there is much land of which not much use is made, yet this is the poorest land and can be profitably made use of only when labor is plentiful and the prices of agricultural products are high enough to justify it.

The adjustment between the population of the city and that of the country has been undergoing a change since colonial times, the city gradually gaining on the country until now (1917) in the United States it is about 50–50 between them. This was satisfactory under normal conditions. It made possible a fair division of labor to the mutual advantage of country and city. While in many respects the farmer's standard of living was too low, his position was gradually becoming better. His numbers grew relatively less with the improvement of machinery and his per capita production increased. This constant adjustment of the balance between the rural and city parts of our population is of the utmost importance to the continued prosperity of both. Owing to the war, the adjustment has been thrown out of balance in favor of the farmer; but, with a good opportunity for permanent economic, social, and scientific improvement, all may yet be well. It should result in a higher standard of living for the farmer after the war.

Back of unsatisfactory economic, social, and scientific conditions in the country, school facilities are still poor and unsuited to the country's needs. Among these unsatisfactory conditions are: inadequate modern improvements such as plumbing and heating in the home; a decaying rural church; local institutions insufficiently centralized and in too small units; failure to apply the scientific discoveries of the agricultural colleges; and failure to use proper business methods, due largely to lack of coöperation. The Federal government's idea of road building, agricultural extension, and industrial schools, 50–50 for the government and the local unit, works satisfactorily.

Lack of capital has much to do with holding back the country. Money is of more importance to the farmer than to other classes. The baker usually bakes every day, except Sunday. If he is running on borrowed capital for his product, he has only to pay interest 1 day or for one three-hundred-and-sixty-fifth of a year. If the rate of interest is anywhere within reason, the baker will not be much interested, because, calculated on each loaf of bread for but one day, it will affect its price but little. The groceryman has in the neighbourhood of 6 turnovers a year. If he is running on borrowed capital, he will have to pay not more than 2 months' interest on each turnover, an amount of no great importance. With the farmer it is different. Including the equipment his annual turnover would be on an average in the neighbourhood of one-sixth of the investment, or 1 complete turnover in 6 years. This is a serious matter. To determine the rate at which he could profitably

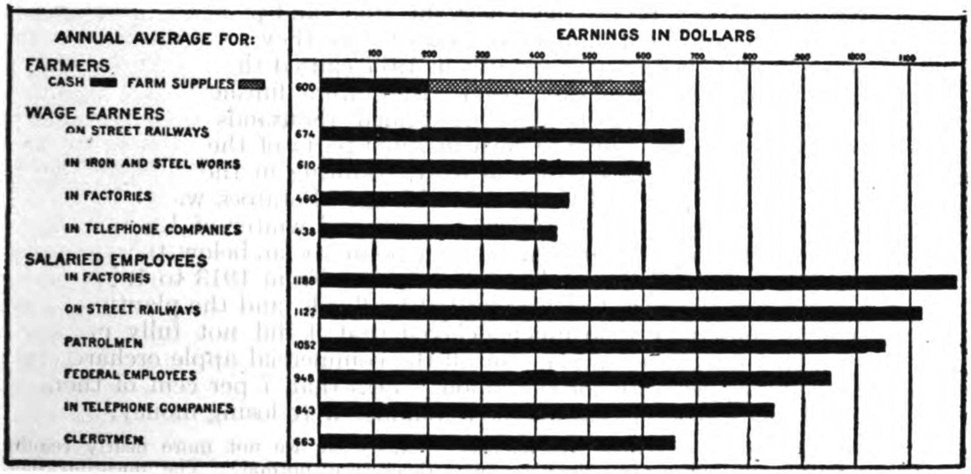


Fig. 32. A comparison of the earnings of different kinds of workers. It must be remembered that normally the cost of living is lower on the farm than in the city. (Farmers' Bulletin 746)

sell the articles he produces on the farm, the farmer would have to take into consideration the amount of interest for 6 years. The question of the rate of interest would be a much more important matter to him than to the baker, groceryman, or almost any other business man. To the farmer the question of whether or not he receives interest on his deposits, and the rate of interest he has to pay on the money he borrows, is extremely serious. His business is so hazardous and his rate of turnover so slow, that to him a loan is like making an investment. It will probably be a long time before the net income from the property will be sufficient to pay the debt, and by that time the property may have depreciated.

The farmer and banker. The farmer, then, should have only a general interest in the ordinary commercial stock bank, which loans current account deposits and, consequently, can make loans only for a short time; rather he should be interested in banks specially organized to suit his business. The land-owning farmer would then have sufficient capital to justify his receiving a long-time loan secured by mortgage at a reasonable rate of interest. Even farmers having no capital to speak of, who desired a personal loan, might be accommodated at a reasonable rate, if a special device were worked out making credit depend on a moral and a material basis. Persons without much capital can borrow, if they can but combine their material solvency, establish a moral guarantee, and take loans only for production purposes. This form of organization has, however, made but little progress in the United States.

The rate of interest the small farmer has to pay comes as a surprise even to the well-informed. In an investigation made in 1914 in an average corn-belt county in one of the leading middle-western states, it was found that the farm owners borrowing on mortgage a sum not exceeding $500, paid, including overhead charges, 11 per cent interest. The net rate of income made on each farm probably did not amount to one third of this rate.

Some of the farmer's difficulties. It is worth repeating that the income of the farmer is haphazard and too small, especially the income of the small farmer. The manufacturer can plan and run his business with more or less clockwise regularity. In addition to the worry of dissatisfied laborers and the difficulties of securing materials, such as machinery, repairs, fertilizer, livestock, etc., which correspond to the troubles besetting the manufacturer, the farmer is beset by another series of difficulties unknown and unsuspected by the city rural reformer. His business cannot be carried on like that of the manufacturer with clockwise regularity and precision. He has no assurance that his plans will work out. At one time his farm is beset by drought; at another by too much moisture; now by insect pests of one kind or another,

at another time by disease; and finally, there may be no satisfactory market for what he raises. The production of the stock and produce to be sold may have been going on for a number of years before they are finished and ready for sale. Drought in the plains states in 1917 caused thousands of cattle and hogs to be shipped to market before they were finished, to the financial loss of their owners. The Hessian fly ruined thousands of acres of wheat in 1916. Drought dried up the corn in some parts of the corn belt. In the northern part it was nipped by the frost, resulting in thousands of acres of soft corn. Cholera claimed thousands of hogs. Potatoes were almost a failure, due to lack of moisture; and in the fall and winter of 1915 the packers lowered the price of hogs and cattle to a point so far below the cost of production that nearly all the feeders lost money. From 1913 to 1917 a considerable portion of the corn belt was visited by floods, and the planting of much corn was in consequence so much delayed that it did not fully mature. A few years ago surveys were made of all the commercial apple orchards in one of the leading apple states of the union. Less than 7 per cent of them were considered financially successful; the remainder were losing money.

Yields, theoretical and actual. One of our leading agricultural colleges considers the following yields practical under favorable conditions as to weather and insect pests, if the best principles of farming are intelligently applied:

Corn	80	bushels per acre
Oats	60	" " "
Wheat	40	" " "
Hay	 3	tons " "

The ten-year average in that state is:

Corn	.......28.4	bushels per acre
Oats	.......24.4	" " "
Wheat	.......14.7	" " "
Hay	.........1.15	tons " "

It is the opinion of the head of the department of agronomy in the same institution that within 25 years, with all the advancement that can reasonably be expected, the yield may be profitably increased to:

Corn	35	bushels per acre
Oats	30	" " "
Wheat	20	" " "
Hay	..........1.5	tons " "

Why can we not more nearly reach the theoretical normal? The question has already been answered: because of unsatisfactory weather conditions, pests, adverse market conditions, lack of capital, and other reasons. It should be remembered that in a great majority of cases the farmer both owns and manages his farm. How many workers in industrial plants could successfully manage their entire concerns? And what is more, farming cannot well be industrialized. Ignorance of these conditions gives the uninformed man a wrong notion as to great profits in farming.

In a recent issue, one of our city journals came out with the statement that the matter with the farmer is that he lacks organization, brains, and capital; that agriculture is conducted without system, without scientific management, and as a hit-and-miss, every-fellow-for-himself scramble, and that it ought to be handled in large, thoroughly organized units under incorporated companies. This is how the city public, also, often look at the business of farming. They mistakenly believe that it would be easy to industrialize it.

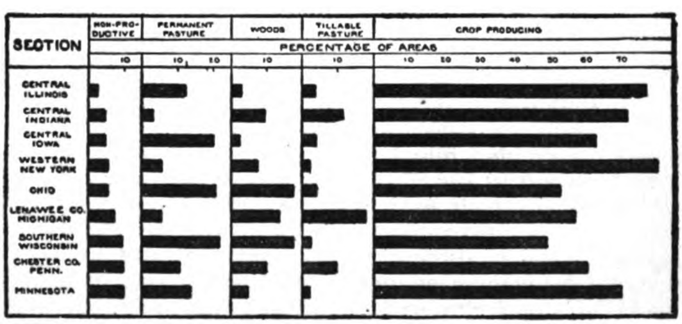


FIG. 33. Chart showing the average percentage of land on farms devoted to different uses in typical farming sections. The non-productive area is a dead load to be carried by the others. See also Fig. 15. (Kansas 20th Biennial Report.)

Tendency toward medium-sized farm. The tendency in the United States is toward the medium-sized farm, that is, a farm on which the head of the family, assisted by other members and an occasional hired man, does the greater part of the work, and which has enough land and

equipment to allow the most economical use of rather large machinery. In the grain region of the Middle West 160 to 400 acres best meet this condition. Where agriculture must necessarily be more intensive, a smaller amount of land will suffice; where it must be less intensive, more will be needed. It is a question not of the greatest yield per acre, but of the greatest yield per man, at least to the point at which the income of the farmer will allow a standard of living sufficient to permit him and his family to be efficient, self-respecting citizens of our republic. It may be truthfully said that, in very many instances, this is not the case. The farmer's school system, his church, his roads, his social life, the equipment of his home are not such as to prevent the ablest and best from deserting the country for the city. This does not alter the fact that, placed in the hands of competent men with adequate capital, the middle-sized farm shows itself superior in production to one of any other size. This is the tale the 1910 Census has to tell in regard to the matter: The very large farms and the farms under 100 acres, used for extensive farming, are decreasing in numbers. It is the farms above 100 acres and probably below 600 acres that are increasing in numbers. Though they are not properly capitalized, and though not run by men especially trained for that purpose, yet they are more efficient in production than larger farms.

This indicates that the attempt to industrialize farming would fail if the family-sized farm had a fair chance. The weakness of the medium-sized farm is on the business side, in which the large farm has the advantage. However, in the hands of competent men, through coöperation, the middle-sized farm should show itself most efficient both financially and socially. In other words, if it is to be given a fair trial, farming in the United States in the future must be carried on on the family-sized farm. This size of farm will also best enable the open country to perform its greatest function—the rearing of men for the entire United States. This improvement of the family-sized farm would also be best for the urban population. It would furnish them food at the lowest possible cost.

The farmer's handicaps. The farmer's capital and his income are not sufficient to enable him to play the important part marked out for him. He needs special organizations adapted to his peculiar wants, and so far there has been but a beginning in their development. The importance to the farmer of securing more capital is seen in the labor income he derives from the different amounts invested in his farm and its equipment. In central New York, according to Warren's "Farm Management," farmers with an investment of $2,000 or less receive, after allowing 5 per cent on the capital invested, a labor income of $192; with an investment of from $6,000 to $8,000 a labor income of $530; and with an investment of $15,000 or more, a labor income of $1,164. This labor income is due to a saving on, or an increased efficiency in, practically every item that goes to make up his capital, as the farm becomes larger, such as size of farm (not larger than family size), machinery, labor, buildings, etc. The average size of the farm in the United States for the production of staple crops is growing larger, and this is because it is more profitable. If the larger part of our farmers had more capital, they would earn a larger percentage on their investment. If they had proper credit institutions they could readily borrow on reasonable terms.

The fact that the farmer's income usually is not received in driblets may be an advantage. It should, and in many cases does, induce saving, and encourages him to have larger visions and to attempt to realize them.

Farmers lack organization. Farmers for the most part have not organized. They are still in the stage of autonomous producers, each one for himself.

Their condition shows this to be a losing game. The farmer must organize or become a peasant. What is the best form of organization? Experience has shown that coöperation (Chapter 6) is the most promising. The genuinely coöperative organization is democratic. It provides for the distribution of profits in proportion to the purchases or sales made or work done. There is a tremendous loss in rural efficiency from lack of organization among the farmers. His purchases are made at retail; his sales at wholesale. This is one reason for his unprosperous condition and isolation. The young farmer should be a leader in his neighborhood and, if possible, in his county and state. He should give liberally of his time and money to awaken other farmers, and should not rest contented until they are organized. The tremendous revolution in the methods of carrying on industrialized business has scarcely affected him in his own methods. In fact, the number of independent farmers in proportion to the population has scarcely changed. How could the more than 6,000,000 such farmers combine to form a monopoly capable of holding its own against the industrial monopolies confronting them? They have been unable to do it. Instead of being able to limit his products to the active demand, as do many industrial concerns, each farmer does his best to produce all he can.

The rise of material forces and machinery have not done for the farmer nearly so much as it has done for those in other lines of activities. How has he done as well as he has? It has been due to fortuitous circumstances. Modern science, the use of natural forces to drive machinery, have done so much more for the city; and the desire of most persons to live away from human isolation has made the city, to them, more attractive than the country. So, in spite of the fact that the surplus population has been reared in the country,

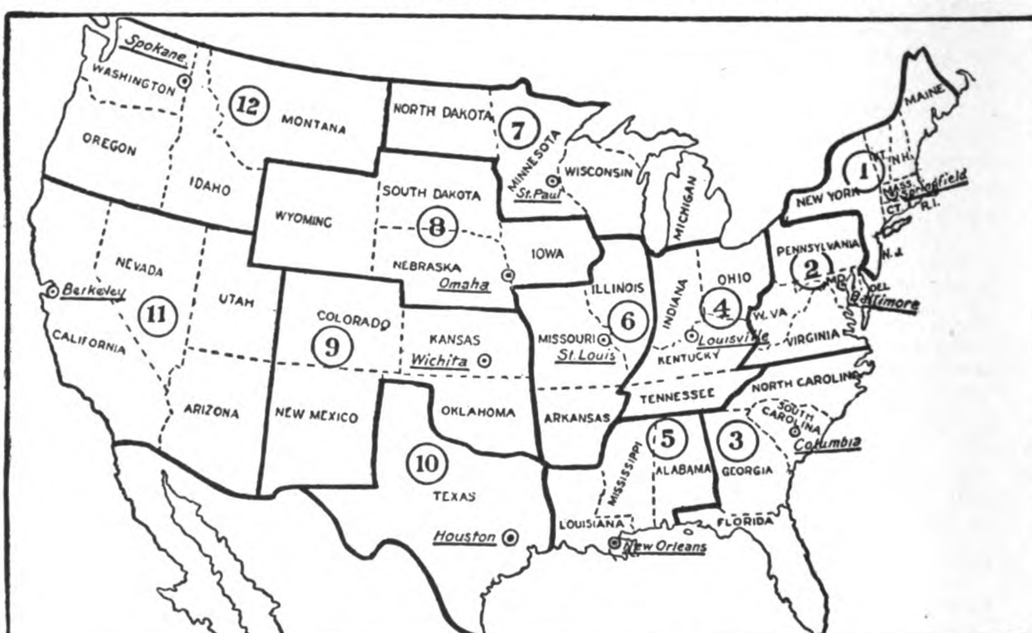


FIG. 34. Map showing the Federal Farm Loan Bank Districts and the location of the bank in each one. (From Bulletin of the Missouri State Board of Agriculture)

enough people have turned away from the environment of their childhood to go to the city to make the balance of the population as between the city and country such as to place the farmer in a much better position than he otherwise would have been.

Of course there is some surplus money in the country. Some farmers have outdistanced their neighbors in this respect. It is their duty to help build up the neighborhood in which they live, to use their influence and means to help their local institutions. The proper division and expenditure of the farmer's income is a difficult matter. His family should be supplied with necessary reading material. This is especially important where there is no local library. The books sold by subscription through traveling agents, and usually found on the shelves of the farmer's bookcase or on his table, are generally almost worthless and represent so much money thrown away. Many of the bulletins of the United States Department of Agriculture and from the colleges of agriculture, which directly pertain to his business, could be secured free of cost.

Woman's life on farm a hard one. The woman on the farm has been given too little consideration. Hers has too often been a life of drudgery. To bear and rear a family, doing the housework, washing, cooking (often for hired men), raising poultry, working in the garden, milking—all this is too much to expect of her, especially after some accumulation of property has been made. Too many think an investment of modern appliances in the home could earn no income. This is a short-sighted viewpoint. As soon as the financial condition of the family permits, modern plumbing, heating, and other appliances should be installed in the home. More contentment and better health should make this a paying investment. A coöperative laundry along with a coöperative creamery would relieve the farm woman of some of her most onerous duties. The reason farm machinery comes first is because it has been thought that the income came from this equipment. A reasonable expenditure in lightening and making more pleasant the work of the women on the farm would add very much to the well-being of the whole family.

Too little attention is given by farmers to politics of the right kind. The result is that there are but few farmers holding high positions in our government, even positions directly pertaining to farm matters. But few men in public life understand the farmers' problems.

Cheap labor should be exposed. Many farmers believe in cheap farm hands. This is a big mistake. On the family-sized farm the income comes from 2 sources: interest on the investment and labor income. Of these the latter is the larger and the more important. If labor is cheap, the farmer and his family, whose source of income comes mainly from their labor, receive a still smaller income. The farmer should oppose the immigration of cheap labor as he would the cholera. If successful, it means for him the ruin of the independent family-sized farm, and the incorporation in its stead of the large industrial farm.

The bank may be of the utmost use and importance to the farmer. That it does not properly meet his needs, there seems to be no reasonable doubt. To him the bank in general is a place to deposit money, without interest, awaiting investment; also, a place where he may obtain money on terms unsuited to his business needs. He takes little interest in the part his deposits play in enabling the bank to manufacture credit and thus loan back to him many times the amount of the bank's ready cash. The commercial banks are not suited to the farmer's needs, even from the standpoint of short loans on personal credit, and of course they are not available for mortgage loans. The security he is required to give is not suited to his condition, and so is hard, if not impossible, to get. The Federal Farm Loan Act does not offer much relief for short-time personal loans, it being designed to meet the need of farmers for long-time loans on farm lands.

Federal Farm Loan Act. The Federal Farm Loan Act, which was approved July 17, 1916, is discussed in Volume IV, Chapter 7, yet it is thought best to insert here the following explanatory paragraphs and table from Farm-

ers' Bulletin 792, "How the Federal Farm Loan Act Benefits the Farmer":

"In order to obtain a loan from a Federal land bank the borrower must agree to use the proceeds of the loan for one or more of certain objects specified in the act, namely, for the purchase of land for agricultural use; for equipment, fertilizers, and livestock for the land mortgaged; for buildings and other permanent improvements on said land; or, with certain limitations, for the payment of indebtedness. The borrower must furnish as security a first mortgage on farm land. The amount of the loan must not be less than $100 nor more than $10,000. The loan must not exceed 50 per cent of the appraised value of the farm land and 20 per cent of the value of the permanent improvements adequately insured. The borrower must be engaged, or about to be engaged, in the cultivation of the farm mortgaged. He will also be required, ordinarily, to become a member of a local national farm-loan association.

"The loans must be made for relatively long periods of time, running not less than 5 nor more than 40 years. Each loan must make provision for annual or semiannual payments on its principal, so calculated that the debt will be entirely paid at the end of the period. After a loan has run for 5 years, the borrower is given the option of paying any additional sum on the principal, in multiples of $25, on any interest date. The accompanying table shows the annual payments required on a loan of $1,000, running for a period of 20 years, with interest at 5, 5½, and 6 per cent."

Amortization table for a loan of $1.000, payable in 20 annual installments, with interest at 5, 5½, and 6 per cent.

Completed years	Interest at 5 per cent				Interest at 5½ per cent				Interest at 6 per cent			
	Payment	Interest	Applied on principal	Principal still unpaid	Payment	Interest	Applied on principal	Principal still unpaid	Payment	Interest	Applied on principal	Principal still unpaid
1.....	$80.24	$50.00	$30.24	$969.76	$83.68	$55.00	$28.68	$971.32	$87.18	$60.00	$27.18	$972.82
2.....	80.24	48.49	31.75	938.01	83.68	53.42	30.26	941.06	87.18	58.37	28.81	944.01
3.....	80.24	46.90	33.34	904.67	83.68	51.76	31.92	909.14	87.18	56.64	30.54	913.47
4.....	80.24	45.23	35.01	869.66	83.68	50.00	33.68	875.46	87.18	54.81	32.37	881.10
5.....	80.24	43.48	36.76	832.90	83.68	48.15	35.53	839.93	87.18	52.87	34.31	846.79
6.....	80.24	41.65	38.59	794.31	83.68	46.20	37.48	802.45	87.18	50.81	36.37	810.42
7.....	80.24	39.72	40.52	753.79	83.68	44.13	39.55	762.90	87.18	48.63	38.55	771.87
8.....	80.24	37.69	42.55	711.24	83.68	41.96	41.72	721.18	87.18	46.31	40.87	731.00
9.....	80.24	35.56	44.68	666.56	83.68	39.66	44.02	677.16	87.18	43.86	43.32	687.68
10.....	80.24	33.33	46.91	619.65	83.68	37.24	46.44	630.72	87.18	41.26	45.92	641.76
11.....	80.24	30.98	49.26	570.39	83.68	34.69	48.99	581.73	87.18	38.51	48.67	593.09
12.....	80.24	28.52	51.72	518.67	83.68	32.00	51.68	530.05	87.18	35.59	51.59	541.50
13.....	80.24	25.93	54.31	464.36	83.68	29.15	54.53	475.52	87.18	32.49	54.69	486.81
14.....	80.24	23.22	57.02	407.34	83.68	26.15	57.53	417.99	87.18	29.21	57.97	428.84
15.....	80.24	20.37	59.87	347.47	83.68	22.99	60.69	357.30	87.18	25.73	61.45	367.39
16.....	80.24	17.37	62.87	284.60	83.68	19.65	64.03	293.27	87.18	22.04	65.14	302.25
17.....	80.24	14.23	66.01	218.59	83.68	16.13	67.55	225.72	87.18	18.14	69.04	233.21
18.....	80.24	10.93	69.31	149.28	83.68	12.41	71.27	154.45	87.18	13.99	73.19	160.02
19.....	80.24	7.46	72.78	76.50	83.68	8.49	75.19	79.26	87.18	9.60	77.58	82.44
20.....	80.33	3.83	76.50	....	83.62	4.36	79.26	....	87.39	4.95	82.44	....
Total	$1,604.89	$604.89	$1,000.00	....	$1,673.54	$673.54	$1,000.00	....	$1,743.81	$743.81	$1,000.00	....

By "amortization," as will be seen from a study of the table, is meant the process of reducing an indebtedness by installment payments through a period of years. In other words, the payments are such as to cover the interest and to settle a portion of the principal so that when the loan expires the debt is paid.

It is well for a farmer, whenever he has surplus money which he does not care to invest, or even when he borrows money, to deposit it in a local bank where he can draw on it. This deposit serves as a checking account for the depositor, and is safer and more convenient than money. The more deposits are resorted to, the higher will prices rise, to the benefit of the farmer, because his products will be higher and the money with which he pays his debts cheaper. Of two customers, one of whom deposits his money and credits as far as possible and the other does not, the former will be the favored customer of the bank. He is of more benefit both to the bank and to society: to the bank because on this deposit the bank can base loans, and to society because it will need less gold to do the work done by these deposits as checking accounts. If farmers are wise, they will take advantage of the profits in deposits and organize personal, credit banks suited to their own needs.

The farmer and his surplus. The farmer who appreciates the economy of owning a farm not so small as to be unprofitable can, instead of modernizing his plant for comfort or putting more money in equipment, use his surplus capital to enlarge it. Within certain limits this is the proper thing to do, but, when once he has acquired a farm of an area most profitable for the kind of farming in which he is engaged, the question arises what to do with his surplus. In this connection it seems quite certain that from lack of opportunity, desire, or capital, the average farmer and his family are not sufficiently acquainted with the information made available by the colleges of agriculture and other sources. The farmer has not as convenient and constant access to desirable reading matter, has not the social opportunities, does not play so important a part in politics, as the city man of the same relative financial position. From the nature of his occupation, requiring during the main working season long hours with physical exhaustion, there is the tendency for him not to become an habitual reader. Besides, his income in the past has been such as to make the most rigid economy necessary.

The farmer and insurance. The farmer may profitably expend some of his surplus in insurance. Insurance is based on a sound economic principle. The modern business man regards it as indispensable. So does the United States Government in connection with the troops; and the enlisted men in the United States Army will in the future be insured, the government and the men each contributing toward the premiums.

To the individual farmer the destruction of his cattle or hogs by disease or the destruction of his grain crop by hail is a matter of great moment. Property in the country is generally isolated. If animals become sick, the veterinarian is probably far away. In case of fire, there is no water system with which to fight it. If hog cholera or other contagious disease breaks out, seldom is the precaution taken of isolating the sick animals, nor is proper sanitation observed. In the case of hail, no human agency can prevent the disaster. The cost of inspecting and adjusting losses is relatively high. The result is a high rate of insurance both from the administrative and the actual loss side. To many companies farming business is unattractive, so that the main inducement to write such insurance is to make unusually attractive profits.

There is one recourse to the wideawake rural community and that is to form coöperative insurance organizations. (See Chapter 6.) Through such organizations the farmers can write their own insurance at a great saving in cost. That such companies are practical has been demonstrated. In some states nearly every county has an active fire and lightning coöperative insurance company for insuring farm buildings, livestock, and farm products. These companies are roughly federated into a state organization. It is not best that they cover too large a territory, for then close inspection for the prevention of fraud would be difficult and expensive. Insurance in such organizations costs the farmer about one third as much as in old-line companies. Cyclone insurance should cover a wider range of territory, because many cyclones extend over a considerable part of a county and the resulting loss would be too heavy if the insurance were too much restricted. Farmers should be encouraged to extend the coöperative plan so as to cover all kinds of risks mentioned above.

Farmers should buy government bonds. In times of crisis the government may be called upon to expend vastly more than its normal income. This deficit in income must be supplied by taxes or by borrowing. The proposition to be supplied by each is a matter concerning which expert opinion differs; but, whatever the proportion fixed upon by the government, each good citizen should do his part. The amount that each is to pay in

taxes is determined by law. This should be met honorably and cheerfully. If the emergency be pressing, borrowing may have to be resorted to. Bonds or other securities for loans must be issued and sold, which it is the duty of each citizen to purchase in proportion to his ability. It is no more the duty of the multimillionaire or the city capitalist to do his part than it is the duty of the ordinary farmer. Simply let each do all he can. A little reflection will enable one to see that these purchases cannot be made from invested capital. They must be made from ready money or from future savings.

Rural conditions call for improvement. The farmers on more than 6,000,000 farms are producing all they can with all their might. No combination or understanding to limit production or to control their marketing exists between them; it is a case of produce, produce with all their might, and do all they can to make their product immediately available for consumption. And under what discouraging natural environment must they produce! Limited by the conditions of space and time, rigid and hard to modify, life has to be created and growth promoted, and machinery can do but little except to improve the environment. Climate and soil are an unchanging basis, and the utilization of great natural forces and the use of machinery have done little save to accelerate the amount of production. Moreover, agriculture cannot well be industrialized, because the same laws as on industry do not always apply. How different are the conditions for the production and sale of industrial goods! There, by the use of unlimited power—steam, electricity, gas, and water—with production in many cases controlled, thus limiting the supply, an effective monopoly is built up which fixes the price to the consumer. Is it any wonder that if the city would-be rural reformer had his way, living in the open country would be made so unprofitable as to ruin the farmer? The farmer in the use of his money should take into consideration the principles of rural economics.

If the future citizen of the United States is to be either country-bred or only a few generations removed from it, it is fundamental to our future welfare that rural conditions be made as attractive as possible, so as to retain in the country that part of its population most suited to be the forebears of the future population, both rural and urban.

FIG. 35. The sodhouse was a common feature of early American farming conditions. We have progressed far; but there is still need for much improvement in rural and agricultural conditions as a whole.

Fig. 36. A good trade-mark is an invaluable asset in marketing. But it also sets a standard that must always be lived up to

CHAPTER 4

The Principles of Successful Marketing of Farm Products

By James Homer Collins, *Investigator in Market Surveys, Office of Markets, U. S. Department of Agriculture. He was born in California, but received his education in Iowa and in Arkansas where he graduated from the State College of Agriculture, having meanwhile spent his vacations and one full year on the farm. In 1913-14 he conducted orchard investigations for the Arkansas Experiment Station, making a special farm study of fruit production in the Ozark section. In 1914 he was appointed Scientific Assistant in Marketing and Distribution in the Office of Markets, advancing later to the position he now holds. His work has included market surveys in many of the principal metropolitan centers, investigations and demonstrations in producing areas during periods of crop movement, and administrative work in Washington. In connection with the National Telegraphic News Service on fruits and vegetables he has visited more than 35 states. He has also made special studies of market conditions in the tomato districts of Florida, the potato district of Eastern Oklahoma, the trucking districts of Mississippi, the fruit districts of Missouri, Arkansas, and the Far West, and the Salt River Valley in Arizona. He has prepared several official bulletins of the Federal Department of Agriculture as well as numerous special reports, articles, etc.*—Editor.

MARKETING is a phase of agriculture which is not well understood by the American farmer. In an age of specialization the farmer's business is developing along two very definite and distinct lines. Production is still the fundamental function, but the problem of disposing of his product is demanding an increasing amount of the grower's attention. He finds himself, in many cases, compelled to fill the dual rôle of producer and distributor, because his business is of such a nature that he cannot easily or economically delegate part of his duties to another. As might be expected, the commercial phase of his work has been subordinated, so far as his own activities are concerned. At this point the middleman has entered the field and, besides exercising the functions which are properly his, has appropriated many of the duties which the grower should perform for himself. There is at the present time a tendency on the part of progressive farmers to assume to a considerable extent those purely commercial duties which might reasonably be taken over by the actual producer. This tendency is regarded by many economists as the best of evidence that present readjustments will ultimately result in a return to the primary producer of a greater percentage of the gross receipts derived from the sale of farm products.

The most serious error of the American farmer is his failure to study in advance of planting time the commercial prospects for the crop he expects to grow. Heavy losses are sustained annually by producers who assume that a

FIG. 37. A crate of melons as received by the retailer. They will be hard to sell, and the farmer who packed them will not be asked for more.

ready demand will manifest itself at harvest time and who fail to make preliminary inquiries as to what the usual commercial history of the crop has been. The wise grower plants those crops (giving due heed to desirable varieties) that are staple on the market and sell readily even in the face of heavy production, and avoids heavy investments either of land or of money in commodities which have a limited demand, even though prevailing prices may be extraordinarily attractive. The farmer who achieves success is the one whose commodities are always salable and whose market is never entirely glutted.

It is manifestly impossible to cover in one brief chapter the entire field of farm marketing. There are, however, certain fundamentals which should be understood by the man who must dispose of the products of his farm; and the attempt will be made in the following paragraphs to cover those elementary facts about marketing with which every farmer should be conversant.

Grading and Packing

Well-known or standard containers should always be used for products sold by the package. In most cases, such containers are the results of years of shipping and selling experience and are the types of package which experienced shippers have found to be most satisfactory under all conditions. The bushel basket, the standard barrel, the 4- and 6-basket crate, the "climax" basket, the apple box, and the 16-quart Delaware hamper are all excellent examples of satisfactory containers. They are, of course, not interchangeable, and the fruit grower who attempted to market extra fancy apples in bushel baskets instead of boxes or barrels would find the returns as disappointing as though he had attempted to introduce a radically new package. It is well to remember in packing goods for market that habit is difficult to overcome. Buyers usually regard with a skeptical eye any innovation either of commodity or of package. The shipper who expects to bill to a new market would do well to make careful preliminary inquiries (preferably of the firm or firms who will handle his goods) concerning the likes, dislikes, and peculiarities of the local trade. Most reliable firms are glad to advise with their shippers, because the selling risk is thus minimized and the returns are more likely to be satisfactory to all concerned. Some large houses are careful to advise shippers as to the best methods of packing, loading, and shipping, and find their return for this extra service in the greater volume of business which results.

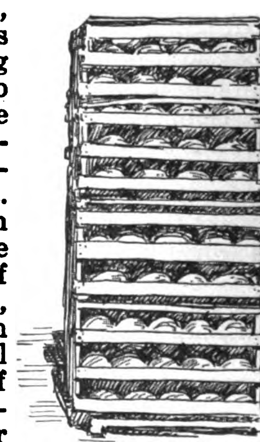


FIG. 38. Carefully sorted and well-packed melons which will bring good prices and stimulate more business.

Container legislation. Of late years, the agitation for standard containers has resulted in considerable legislation, both state and national. The provisions of these laws and regulations are known to but few farmers, and there are many instances of unintentional violation of the law. Growers who are in doubt about Federal laws and regulations should write to the Secretary of Agriculture, Washington, D. C., asking for specific information to fit their cases. The Dairy Commissioner or Food Commissioner or the Director of the State Agricultural Experiment Station can usually advise regarding state regulations.

Plowing 20 acres of sodland per day. Extensive methods may mean smaller yields per acre, but they also mean a lower cost per unit of area and of production

To know the cost of a crop, one must keep an accurate record of the time spent upon it by each man and by each beast

MODERN FARMING AIMS ESPECIALLY AT THE REDUCTION OF LABOR CHARGES. IT ALSO INCLUDES IMPROVED MEANS FOR KEEPING TRACK OF THEM AND ALL OTHER ESSENTIAL FACTS

Get the habit of telling what you want and what you have to dispose of; it brings business

Whatever your style of package, make it attractive, uniform and fair—both legally and morally

High quality products and a high class market justify extra care and expense in packing and marketing

One of the Commonest Causes of Farm Failure Has Been a Lack of Business Methods; Here is Where the Farmer Can Take a Lesson From His City Cousin

The farmer whose goods are of superior quality, carefully graded, and properly packed never lacks for a market. A glutted market is disastrous chiefly to the shipper whose goods are indifferent in quality, appearance, and pack. The thoughtful farmer should remember one fact—the lower grades of farm produce are proportionately more affected by a general decline in prices than are the fancy grades. A general weakening in the tone of the market always manifests itself first in the movement of second-class commodities, and the divergence in price quotations between poor and high-class commodities is always more marked during periods of market depression. Quality products sell readily, even under the most adverse conditions. This fact is taken advantage of by shippers in certain districts where careful grading is almost universal. The apple growers of the Pacific Northwest have, by the application of rigid grading and packing rules, created a market for their fruit which is nearly distinct from the barrel apple market. Grading and standardization have been among the greatest influences in expanding the market for citrus fruits, and to-day the orange is as staple a commodity as the apple on the great metropolitan markets. Potato growers on the Eastern Shore of Virginia have established an enviable reputation for their output and have thus been enabled to place cars in markets as far west as Kansas City in the face of active competition from middle-western growers. In general, the expenditure of time and money necessary to raise the standard for farm products has returned to the growers many times the original investment.

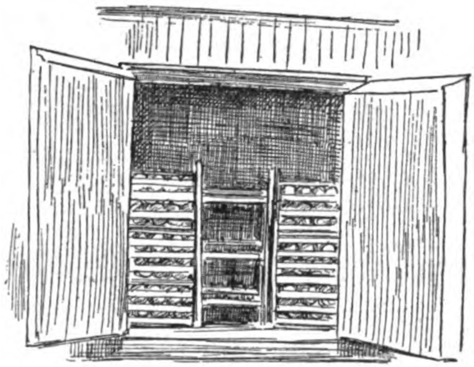


FIG. 39. Showing how to pack and brace crates of farm products in a freight car. Care must be used all the way from the farm to the consumer.

Methods of Sale

Consigning. Consigning may be defined as that method of marketing farm products wherein the producer utilizes the services of a commission merchant in disposing of his produce, paying therefor a definite percentage of the gross receipts. It is perhaps the most elementary form of selling produce through commercial trade channels, and because of its simplicity and availability is the usual resort of the small producer. The farmer who has no established trade connections or who has no local outlet for small quantities finds his only salvation in the commission method of sale.

Few farmers realize the absolute necessity of making an intelligent selection of the agent to whom they entrust their goods. To the grower who desires to exercise care, the first consideration, of course, is the business and moral responsibility of the commission man. The small shipper can often secure the names of reliable concerns from big carlot shippers in his vicinity. Local freight agents, also, are sometimes well informed and can be of assistance to the inexperienced shipper. The commercial rating of any dealer may be secured from publications issued by concerns which make a specialty of preparing such statements. While these commercial reports cannot, because of their very nature, answer the farmer's natural query, "What is the best commission house for me to use?," they are without doubt the most reliable source of information for the producer who has neither experience nor personal counsel.

One matter often overlooked by shippers is the difference in the character of business conducted by various commission firms in the same city. Most houses will handle all classes of produce, but specialize on certain commodities or on goods from certain districts. The dealer who makes a specialty of the apple trade will probably prove the most satisfactory agent to negotiate the sale of the farmer's apple crop, because he has developed special outlets for this type of fruit. The

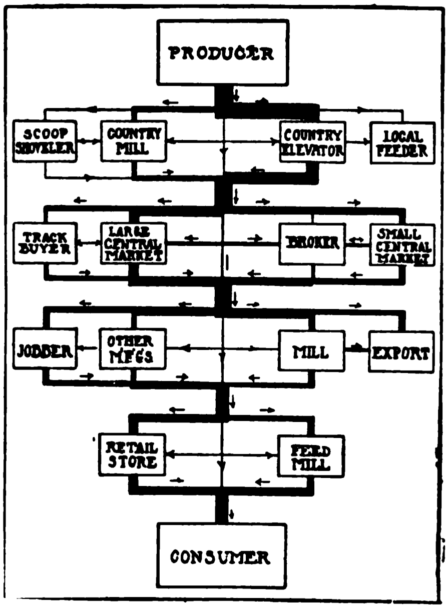


FIG. 40. Principal channels for distribution of grain and grain products. The comparative volume of trade through each is suggested by the width of the connecting lines. (U. S. Dept. of Agr. Bul. 558.)

house which finds its chief source of supply in the trucking districts of the South is apt to have special facilities for the disposal of such crops as lettuce, snap beans, tomatoes, celery, peppers, etc. Eggs, butter, poultry, and allied products should be shipped to firms who have developed this side of their business. The advertisements of most firms indicate their specialties and to this extent may serve as a partial guide to prospective shippers.

Division of shipments among several dealers unwise. The most common weakness of the small or occasional shipper is his tendency to divide his shipments among several dealers, or to change market representatives every season. He has a perfectly natural impulse to attempt to increase net returns by trying several selling agencies. It is safe to say that every "fly-by-night" concern organized for the purpose of exploiting the farmer has had its inception in the farmer's weakness for "swapping horses in mid-stream."

Many commission houses make a practice of keeping their regular shippers in touch with all prevailing market information. This information is of value to the farmer who discriminates in the choice of his representative and who is duly cautious about accepting information which may be biased by the self-interest of the commission man. The daily, semiweekly, or weekly quotation sheets issued by reliable distributors are often the best guide for the producer who has been unable to follow market conditions day by day. The commission man is also a good informant on questions relating to type and size of package to use, methods of grading, packing, loading, and time to ship.

Well in advance of arrival the shipper should advise the commission merchant of the date of shipment, grade and package, route and billing, so that arrangements may be made for the proper receipt and disposition of the goods. A day's delay in the yards of a big terminal market may mean the difference between profit and loss to the farmer. It is necessary that there be close business coöperation between the producer and his salesman at market. Such coöperation is often fostered by a personal visit to consuming centres. The ideas secured by such a visit will more than repay the expense of the trip.

Commission charges vary with different commodities, but are fairly uniform for the same product. On perishable fruits and vegetables the usual charge is 10 per cent of the sale price. The commission charge for selling livestock in carloads at the principal wholesale markets varies from $5 to $20 per car, the usual charge for cattle being about $12. Charges for other products vary with the value of the consignment or its perishability.

F. o. b. selling and its limitations. The abbreviation f. o. b. means literally "free on board." During the past 10 years the f. o. b. sale has been gaining rapidly in favor, its merits appealing so strongly to the small farmer in particular that he has come to regard other sales as makeshifts. The f. o. b. sale is known wherever farm products are sold and is extensively employed by producers in all parts of the United States.

In general there may be said to be two types of f. o. b. sale, namely: (1) f. o. b. for cash (rather uncommon), and (2) f. o. b. usual terms. The latter implies payment at time of delivery after inspection of the goods by the purchaser. "F. o. b. point of origin" and "f. o. b. New York" are phrases having a distinct meaning. The f. o. b. sale where payment is made and ownership passes at the time delivery is made on board cars at point of origin has come to be known as the "cash track sale" in contradistinction to the sale "f. o. b. usual terms," where payment is made at time of delivery at destination, although on the basis of a price quoted on board cars at origin. It will thus be seen that the sale "f. o. b. usual terms" is merely a contract for the purchase of goods on the basis of a price on board cars at origin, the sale not being completed until inspection and acceptance of goods by the purchaser at destination.

The cash track sale has several obvious advantages which commend it to the small grower in particular. The risk of loss or de-

terioration in transit are assumed by the buyer, negotiations are simple and personally conducted, and payment is made promptly and in cash. These conditions of sale are the ideal toward which many producers are striving, and the cash track sale is usually satisfactory to the small farmer.

Opponents of the f. o. b. usual terms sale claim that the buyer always has the benefit of the doubt, as he may accept goods on an advancing market and reject them on a declining one, the shipper taking the loss in either case. One of the most important farmers' coöperative associations in the United States, which markets a large part of the potato crop produced in an eastern state, makes most of its sales on an f. o. b. basis. On the other hand, a strong association which disposes of 70 per cent of the citrus output of a western state is opposed to the principle of the f. o. b. sale on the ground that it encourages speculation and hence is detrimental to the best interests of the grower. There can be but little doubt that, with a marketing organization constructed along the lines of the latter association, the grower will benefit by delivered sales.

Contract sales. There are two general types of contract which have to do with the marketing of farm products, namely: (1) the contract to market goods through some individual or corporation acting as agent for the grower, and (2) the contract to sell produce to some individual or corporation. Contracts between growers and selling agencies are common in all parts of the United States. All of the cantaloupe growers in California and Colorado, many of the apple growers of Colorado and the Pacific Northwest, and some strawberry growers in Florida arrange for the disposition of considerable quantities of their produce by selling agencies with whom contracts have been signed.

The agency contract. The agency contract (so called for lack of a more expressive term) is often based on advances of cash or the equivalent in crate, fertilizer, or spray material made by the selling agent to the grower. Many distributing companies owe a large part of their business to their ability to finance the grower at the time financial assistance is imperative. The life of this form of contract is usually for the period of indebtedness. The selling agency almost invariably reserves the right to exercise general supervision over the preparation of the product for market. Usually the goods are packed by the grower, sometimes by the selling agent, but in either case the agent reserves the right to reject products which, because of inferior pack or grade, he deems unsalable at market.

Most contracts call for the delivery of produce at the loading platform. The cost of loading into cars and bracing is sometimes borne by the grower and sometimes by the distributor, depending upon the selling charge. The agent may receive a commission (5 to 15, usually 10, per cent) or he may be paid a fixed sum per package.

Penalties for violation of contract by the grower vary with the contract. Certain western cantaloupe contracts require the grower to pay 25 per cent more for crate material if he sells any of his output except through his regular agent. Most contracts require the grower who "sells outside" to pay to his regularly constituted agent the full selling charge or commission on goods so sold as liquidated damages.

The sale contract. The best examples of what might be termed the "sale contract" are the various agreements between producers and canneries, pickle factories, sorghum mills, and the like by which the farmer agrees to sell directly to the second party of the contract, at a price and subject to stipulations set forth in the agreement. Most contracts of this nature specify in advance the price which will be paid. Others (such as those in vogue in the grape belt of western New York) obligate the purchaser to pay the highest prevailing market price for the class of goods delivered. Various conditions surrounding the industry determine which of these agreements will be entered into.

Marketing under contract possesses some very obvious advantages. Probably the most appealing of these advantages to the small grower is that he brings his crop to maturity secure in the knowledge that he has arranged for its sale in advance. Farm products marketed under contract usually come on a market prepared in advance to handle them. The importance of this fact can hardly be overestimated, since a very considerable portion of the loss annually sustained by inexperienced shippers is due to the indiscriminate billing of produce to markets not prepared to handle the same. Definite arrangements for selling perishables must usually be made by distributors in advance of the receipt of goods, and in this respect the grower who has contracted to deliver a certain quantity at a specified time has a very decided advantage at market. There is also usually some provision made for more careful grading and packing of a crop handled under contract than would be effected under a system of individual marketing.

The chief disadvantage of the contract system to the farmer whose output is well graded and packed for market is that he is obligated in advance to make a certain disposition of his goods, and for that reason may find it necessary to refuse more attractive offers at harvest time. Some contracts obligate the grower to purchase containers and other supplies from the selling agency at prices rather in advance of those which he might have to pay if he were free to purchase these supplies in the open market.

Analysis of most contracts now in effect, however, lead to the conclusion that under present methods of handling farm products, the contract is worthy of encouragement and development, and, when entered into in good faith by both parties, is usually successful where conditions make this system feasible.

Sales in transit. Reference is made to the sale of cars which have been rolled unsold from the shipping point, either as "tramp" cars, or billed to some diversion point. Shippers in many sections of the country regularly bill their cars in the general direction of the markets they expect to utilize and then communicate by wire with prospective buyers. Should the car be sold before it reaches the first diversion point, the necessary diversion orders are wired and the car diverted to the proper market. Should the shipper be unable to sell the car by wire within a reasonable time, he permits it to go through to the likeliest market in the general direction in which it is billed and instructs some commission firm or broker to handle the consignment for his (the shipper's) account. Vegetable and fruit shippers in Florida and other southeastern states are much given to rolling cars unsold in order to secure the benefit of any general rise in market prices which may occur subsequent to the time of shipment. In some instances cars of Florida tomatoes have been diverted as many as eight or nine times. It need hardly be said that this is an abuse of the diversion privilege which adds greatly to the cost of marketing. On the whole, however, sales in transit have proved reasonably satisfactory, especially during seasons when the f. o. b. demand has been inactive.

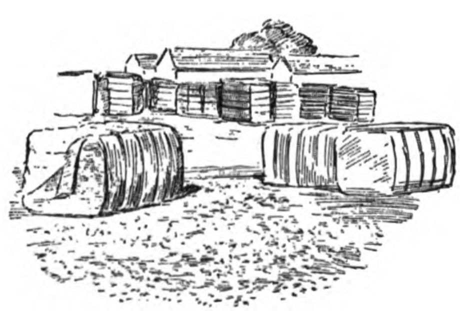


FIG. 41. Cotton left lying on the ground easily becomes damaged and loses value. Carelessness of this kind is a common cause of poor results in marketing.

Shipping-point auctions. Shippers in some districts, in order to stimulate a more active f. o. b. market in producing territory, have

organized local auctions. Buyers attend these daily auctions during the shipping season and compete for the offerings. This type of open local market has been attempted in the strawberry district of Louisiana, the peach territory in northern Ohio, and at various other points. It has proved reasonably successful where there existed honest competition between buyers, but where the latter are few in number there is a constant temptation informally to organize and agree on the maximum price which they will pay. The local auction has not received the attention it deserves; where started under the proper auspices and capably managed, it has inherent possibilities which should not be underestimated.

Municipal markets. Municipal retail markets have been utilized quite extensively by truck growers who live near many of our large cities. The municipal market has found its greatest development in the more thickly populated territory comprising the North Atlantic states. An appreciable proportion of the fruit and vegetable supply of such cities as Philadelphia, Baltimore, and Washington passes through the public market. The elaborate delivery and credit systems maintained by many retail stores have been responsible for the large business which these stores handle in direct competition with the municipal market. With the consuming public educated as to the economies to be effected by patronizing the public market, the municipal distributing centre would rapidly assume its rightful position as an important factor in reducing the high cost of living. Many municipalities have lately manifested a desire to give the public market an impartial trial, and the impetus thus given to the movement may result in appreciably lower living expenses in these cities. Capably managed, the public market has great possibilities.

Parcel post and express shipments. The quantity of farm products shipped from farm to market by parcel post or express does not constitute a very large percentage of the total food supply. Eggs, butter, fancy fruit, and similar products may be sent by parcel post from producer to consumer after preliminary business arrangements have been entered into. It has proved rather difficult for the average small farmer to establish satisfactory connections with city consumers, or, having established such connections, to collect on delivery of goods. In a limited way, however, some growers located near consuming centres have built up a satisfactory business direct with the consumer. Express companies handle even larger quantities of farm products. Many small towns depend for most of their fruit and vegetable supply on express shipments from nearby cities. The express business from farm to market is not quite so extensive, although the total annual movement assumes fairly large proportions.

The fruit auction. During the past five years a steadily increasing number of fruit and vegetable shippers of the United States have been awakening to the possibility of the wholesale auction method of sale. As a result the auction has been forging to the front as an important factor in the marketing of the fruit crop from certain districts. Beginning in a small way as an untried experiment, it has gradually become the sales medium for fruits whose aggregate value runs into the millions. Public auctions have been established in more than 20 of our metropolitan distributing centres and the list is growing yearly.

The fruit auction is conducted in exactly the same manner as any other public auction, the offerings being divided into lots and competed for by attending buyers. In many cities the auctions are financed by members of the local wholesale trade, individually or collectively. Some auctions have been financed by independent capital, and, to this extent, are presumably free from entangling alliances with the local wholesale trade.

No model form of organization has yet been evolved and no fruit auction can be regarded as a model of its kind on account of its form of organization. It is obvious that any auction dominated entirely by the local wholesale trade and operated solely in the interest of such individuals cannot give the shipper a proper representation at market. It is, however, only fair to the many high-class auctions financed by members of the trade to say that usually there is no attempt to give the buyer an undue advantage over the shipper.

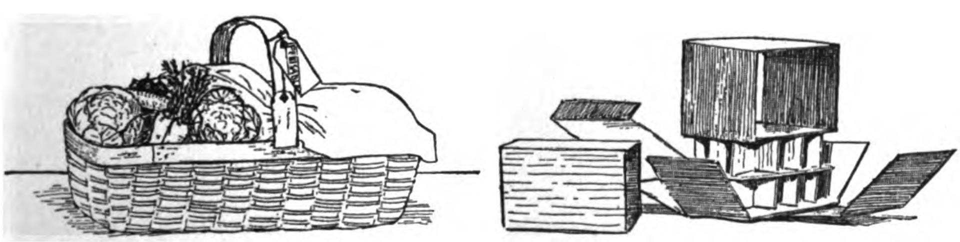


FIG. 42. Two suitable containers for the parcel-post shipping of farm products. Appearance is a very important factor in all direct producer-to-consumer marketing systems

Large quantities of citrus fruits are sold at auction each year. In fact the major portion of citrus fruits handled in cities which have auctions are sold in this way. Much of the deciduous fruit shipped to auction markets by growers living west of the Rocky Mountains is also sold through the auction. Each year finds larger quantities of such commodities as eastern apples, cantaloupes, peaches, etc. sold at auction.

Abuse of the auction. One thing which has militated against the success of the auction has been the tendency to use this sales medium as a general dumping ground for the disposal of goods which could not be sold at private sale. Eastern shippers are still too prone to regard the auction as a last resort. Without a doubt, however, the auction has been a very great benefit to shippers whose goods have reached overloaded markets, and it can be credited with doing as much in stimulating demand as any other sales medium in the country to-day.

The fact that the auction often offers the best outlet for fruit which is not salable through other media has worked to its disadvantage in many cases. Too many shippers have come to regard this sales agency as an outlet for fruit which is unsalable because of quality, condition, or the state of the market. There is the same tendency on the part of most buyers, and this attitude of mind causes them to feel that auction prices should not be so high as those which would be paid at private sale. The vigorous campaign which is now being waged by many auction companies may serve to educate shippers with respect to the true function of the auction. When this is thoroughly understood, the auction will doubtless take its rightful place as one of the most important media for the distribution of perishable foodstuffs.

Under present arrangements it is usually desirable for the shipper who expects to use the auction to bill his goods to some broker or other representative, who, in turn, places the fruit with the auction company. Under better business arrangements there will doubtless be an increased number of shippers who can bill their fruit through to the auction and thus save for themselves one selling commission. The fact that there is little provision for the shipper who bills through to the auction is one of the chief disadvantages of the present auction system.

The exponents of the auction have in some cases been overoptimistic. Their tendency to regard the auction as a panacea for all selling evils must be taken with a degree of conservatism. The auction is not a cure-all for marketing problems, but in its own way it bids fair to be one of the greatest agencies for good in the history of the fruit-selling industry. The ability of the auctioneer to place large quantities of perishable foodstuffs before groups of assembled buyers has been a mighty influence in expanding the market to care for products which under ordinary methods of sale would either show a loss to the grower or be absolutely unsalable. Students of marketing problems are expectantly watching the auction, and important developments may reasonably be expected in the near future. It is altogether conceivable that the producer of the future may come to realize more and more the possibilities of this method of sale.

The Middleman

The term "middleman" is one which has been rather indiscriminately applied to the large class of dealers who act as intermediaries between the producer and the consumer. Strictly speaking, any agency which levies a toll on foodstuffs in the process of marketing might be considered as a middleman to that extent. However, custom has designated certain marketing agencies as true middlemen. For the purpose of this discussion, it will be necessary to classify only 5 types, namely: (1) the broker; (2) the commission man; (3) the wholesale carlot buyer; (4) the jobber; and (5) the retailer. The farmer's primary financial interest centres around the activities of these 5. It should not be understood, however, that these types are always distinct and separate entities. Thus the wholesale carlot buyer may act in the capacity of commission merchant for certain goods which have been consigned to him. The commission merchant may not receive all of his supplies on consignment and may find it necessary to purchase in small lots from wholesale carlot buyers and thus assume the functions of the jobber. As a matter of fact, many large wholesale firms, especially those dealing in fruits, vegetables, and other perishable commodities, simultaneously carry on the business of the commission man, the wholesale carlot buyer, and the jobber. It may perhaps be well to describe briefly the functions of each of these, despite the fact that their activities may overlap in actual practice.

The broker. The broker usually deals in carlots, acting merely as the shipper's agent in negotiating sales. He sells largely to the wholesale carlot buyer. In some instances brokers have expanded their business to include less than carlot sales, and these brokers are usually known as "split car" brokers. They receive cars billed to them and divide the contents among several buyers, thus apparently usurping the functions of the commission merchant. The primary difference, however, is that the broker makes all sales direct from the car and maintains no store for disposing of any of his wares. There have arisen during late years certain distributing companies whose functions are essentially those of the broker. These companies or exchanges maintain offices in many of the principal markets and in addition to offering to the grower the services of a first-class broker are enabled in addition to secure for him a wider distribution of his carlot shipments than he could expect from the broker whose business is centred in one city.

The broker's services are utilized extensively by shippers who prefer not to consign and who have no established trade connections to whom they can sell direct. Since the broker acts merely as a selling agent, the shipper often stipulates that all sales must be subject to confirmation by wire. This is a wise precaution which permits the shipper to decline an offer which he feels detrimental to his interests.

The broker requires comparatively little capital, and for this reason irresponsible persons have often engaged in the business. Many of the most reliable brokers are heavily bonded. The shipper may recover on this bond any damage which results from carelessness or fraud on the part of the broker. The services rendered by the broker are very real ones, and the shipper who sells through a broker has for a reasonable fee secured the services of a skilled personal representative at market. He inspects cars upon arrival, negotiates their sale, and, where cars have been unjustifiably rejected, sees that the shipper receives justice. Selling through a broker involves an extra selling charge which some shippers do not care to assume. Others feel that economy demands that they be personally represented at market. The problem is one which each shipper must decide for himself. There can be no doubt, however, that the competent, honest broker will often save many times his fee to the shipper who needs representation at market.

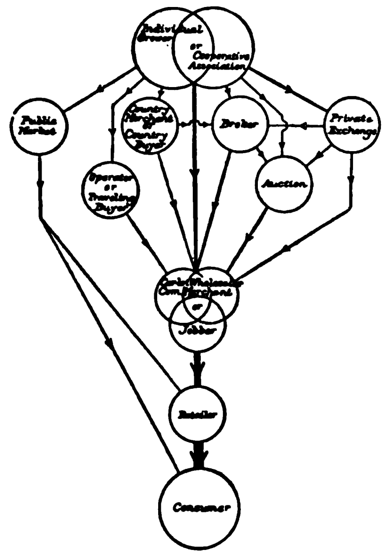


FIG. 43. Main channels of distribution for fruits and vegetables. Every additional agency between producer and consumer means an extra handling and an extra profit which must be added to the final cost without benefiting the grower. (U. S. Dept. of Agr. Bul. 267.)

The commission merchant. This distributor is used extensively by shippers who cannot sell f. o. b. and who have no other market connections. The commission house offers what is probably the best outlet for the small or occasional shipper who cannot furnish a dependable supply for direct sale. The business of the commission man, however, is not confined entirely to the class of business indicated above. His services are utilized by all classes of shippers in disposing of practically every agricultural commodity. The commission man comes nearer to being the universal distributor than do any of his business associates. Commission sales are regarded by some important shippers and shipping organizations as preferable to f. o. b. usual terms sales, since the grower benefits by any rise in price subsequent to shipment. This method of sale also obviates the danger of unjust rejections. Many growers are suspicious of commission men because of the bad name which has been given to the whole body of them by irresponsible firms who in the past have exploited the shipper. The dishonest

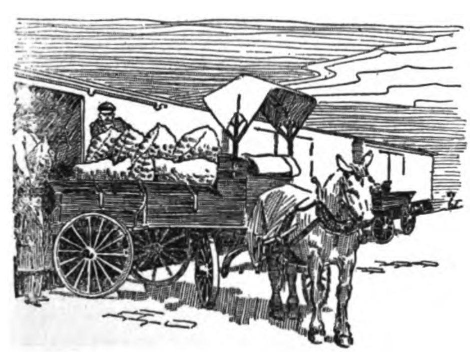


FIG. 44. Loading a wholesaler's wagon. The hauling charge is about two cents a bushel making the wholesaler's total charge about seven cents. (Wis. Bulletin 256.)

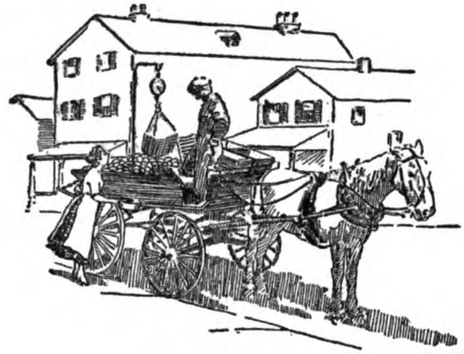


FIG. 45. The most direct system of marketing for the farmer located near his customers. Usually the city peddler is the last of a long line of middlemen.

firm, however, is invariably short-lived, and a shipper who deals with well-established, financially responsible concerns need have little fear. The commission method of sale is fundamentally sound, and the grower who satisfies himself as to the rating of his commission merchant will usually be assured of a good market connection.

The wholesale carlot buyer. This type of distributor purchases direct from the shipper as a rule, such purchases often being f. o. b. usual terms. Many of these firms have regular territory to which they look annually for their supplies. Most of the purchases are made from growers who are known to them. Some purchases are made by traveling buyers who pay cash at the shipping point. The advantages of the latter to the small shipper are very obvious. He may not secure the full market price, but cash at the time delivery is made to the car is a very important consideration. Wholesale carlot buyers handle a very large business annually. Some of these firms have injured their reputations in the past by purchasing f. o. b. usual terms and then declining the shipment on arrival because of a weaker market. The sentiment of the better class of trade is much against this practice, and the firm which earns a reputation as a "ready rejector" will soon find its source of supply seriously curtailed.

The jobber. These dealers secure much of their supply from the wholesale carlot buyer. Practically all of them also act in a commission capacity and solicit consignments from shippers. The farmer does not deal with the jobber direct, except in those cases where he deals with a jobbing firm which also does a commission business. The jobber is merely the intermediary between the carlot buyer and the retailer. There is some confusion in the use of the term "jobber," and in some cities the carlot buyer is referred to as a jobber. In most cities, however, the term clearly defines the agency which buys from the carlot receiver and sells to the retailer.

The retailer. An attractive business with the retailer has been built up by some producers who have very fancy stock in such quantity as to constitute a dependable supply. This outlet for the grower is, however, rather limited and is not susceptible of very great expansion. It has become nearly impossible for the unknown producer to sell large quantities direct to the retailer. The latter prefers to look for his supply to the wholesale trade with whom he can deal in a business way and upon whose supply he can depend. The retailer who "buys direct" may find the wholesale trade refusing to supply him and may find his credit suffering. It usually takes considerable time to establish satisfactory connections between the producer and the retailer, and this outlet must not be depended upon by the small grower who is unfamiliar with trade practices and methods.

Coöperative Organization

It is entirely outside of the scope of this paper to discuss the entire field of coöperation. The problems involved are so large and the activities so manifold that passing mention only can be given to the more salient features. Coöperation among producers is now in its infancy, yet the number of existing organizations would surprise many who are not thoroughly conversant with all the facts. Practically every state in the union can offer examples of successful coöperation. Extensive forms of agriculture, such as grain farming and dairying, afford the greatest number of examples. Farmers' coöperative grain elevators and creameries in the United States may be numbered by the thousands. Even cheese making, a side line of the dairy industry, is carried on by several hundred coöperative factories. It is almost impossible to estimate the total number of coöperative fruit, vegetable, and livestock marketing organizations that may be found wherever farm products are produced in large commercial quantities. While some of these organizations may not conform to prevalent ideas regarding the form which farmers' organizations should take, nevertheless the coöperative idea forms the basic structure.

Why many farmers' associations fail. The failure of so many farmers' associations each year is largely due to the fact that these bodies are hastily organized and that too often the organizers had no very clear conception of the problems with which they would be confronted. Successful organizations are almost invariably the result of careful planning on the part of a few leaders who have endeavoured to secure as much advice and assistance as possible prior to forming the associations. First and foremost the plan of organization must be suited to local conditions. Many communities have attempted to transplant bodily organization plans from some other district and adopt them without modification. Where conditions in the two sections are essentially different, such a plan has almost invariably resulted in failure. Other growers do not realize the absolute necessity for capable management and feel that most of their problems are solved when the organization has been finally effected. These growers usually find that their troubles are really only beginning and that the employment of a tactful, skillful, and experienced manager is the most economical plan to adopt.

A farmers' organization must be conducted upon business lines. The community which organizes for social activities as well as for marketing often finds that the social end of the organization prospers at the expense of the commercial end. The constitution and by-laws must set forth very clearly the relation between the member and the association. Where the member is closely bound to his organization by the terms of his agreement, the organization takes on a stability which it would not otherwise possess.

Standard of output must be maintained. No marketing organization can succeed for any great length of time whose output is not kept to a certain standard. Practically all of the large marketing organizations now in existence owe a large part of their commercial success to the well-graded, well-standardized character of their output. During the early period of its existence each organization should establish grades and standards which will be applicable to commodities handled through the association. An attempt should be made to adhere as closely as possible to these established standards, and the most rigid grading and packing rules should be followed. Some system of association inspection is practically necessary, as the individual member is seldom qualified to grade and inspect his own product.

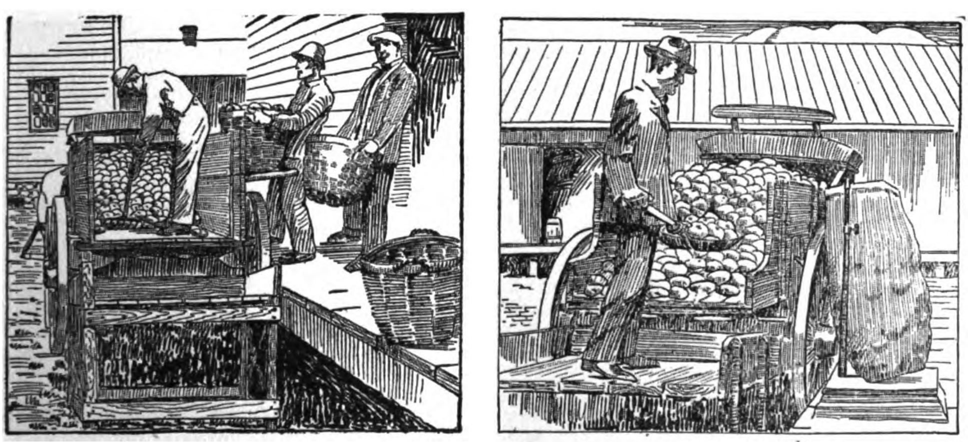


FIG. 46. Poor economy (*left*) and improved methods (*right*) at a potato warehouse. Where the work, as here, is intermittent the men are sure to waste time waiting around. Machinery would do better work and cost less when not busy. Even a bag holder, freeing one man, is a real time saver. (Wis. Bulletin 256.)

The loyalty of the individual members to the association is absolutely essential to success. Any organization whose members are disgruntled or lacking in coöperative spirit is almost sure to fail. The most capable selling machinery in existence could not work to highest efficiency if the shippers were not offering the fullest and most complete coöperation.

Nearly every new marketing association meets with the antagonism of those who have been profiting by the growers' previous lack of organization. Growers who organize must understand that efforts will be made to attack the association. A common method of attack is for the independent buyer to offer the association member more than can be secured through the association. Some organizations have met this attack by requiring the member to turn such bids over to the association to be filled from the member's goods. This enables the grower to secure the advantage of the higher price and at the same time gives to the association the credit for the sale.

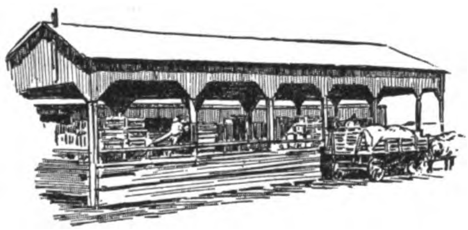


FIG. 47. A good fruit-shipping platform for a coöperative or community organization

Financing of associations. It is not possible to dwell at any length on the financing of farmers' organizations other than to indicate some of the sources from which funds are secured. Associations which conduct a consignment business usually need very little capital and are able, by the collection of membership fees and the accumulating of a small surplus from selling charges, to handle their business adequately. Other associations which have developed a large f. o. b. business require a larger working capital. Local banks have often been induced to lend substantial financial assistance to farmers organized for marketing. Farmers' coöperative grain elevators in the Northwest are often financed by commercial firms who thus secure the patronage of these elevators. Several associations meet the expenses incident to marketing by borrowing money from their own members. There is no ideal method of financing a coöperative marketing association. Local conditions must be taken into account and funds secured from the most readily available sources. The association which has organized along strictly business lines, whose membership is composed of influential, intelligent producers and whose output is large enough to warrant its existence, seldom lacks money for legitimate needs. The organization which has been hastily formed by inexperienced enthusiasts is the one which oftenest finds itself lacking the financial support which is indispensable.

Benefits of coöperation. The benefits of coöperation among producers are legion. A great deal of the standardization of farm products effected in certain districts is traceable to the efforts of local marketing associations. Association products are usually better graded, better packed, and shipped under more distinctive brands than are the products forwarded by individual shippers. The coöperative association has often been responsible for developing a more widespread demand for the products of certain districts. Thus the organized efforts of citrus growers during the past 20 years have placed the orange on a par with the apple as a staple everyday fruit. The demand has increased far beyond the expectations of early growers of this fruit. Growers through community action have been enabled to pool losses incurred by disastrous slumps in market prices, thus lightening the burden which would otherwise have fallen upon a few shippers. Financial backing for an established organization is much easier to secure than for the individual. Banks have loaned as much as $500,000 to apple-shipping associations in the Northwest, to finance the marketing of one season's crop. The individual grower cannot afford to employ a skilled marketing agent. In coöperation with his neighbors, however, he is enabled to employ high-salaried agents to protect his interests at market.

It will be seen from the above that the effects of organization are far-reaching. The benefits are so real and so tangible that it is surprising that the coöperative idea is not more widespread than it is. While not a universal remedy for all marketing troubles, coöperation offers the most economically sound basis for better agricultural marketing than has yet been devised. Each year finds a greater number of growers organizing for mutual benefit. There is probably a greater opportunity for all growers, both large and small, in coöperation than in any other plan which is universally applicable.

Market Price Quotations

Market price information is now available to the producer from several important sources. The Bureau of Markets of the United States Department of Agriculture issues special market reports on fruits, vegetables, hay and grain, meat and livestock, honey, and other commodities which are being daily added to the list. Many of these reports are released daily, some weekly, and others once a month. They may be secured free of charge by any producer who indicates a need for the service. The principal trade papers, also, carry very comprehensive market reports covering the period between issues. Daily "price currents" are issued by companies operating in many of the principal markets. These price currents quote most of the agricultural commodities being offered for sale on the market. Most of the important daily papers devote space to market reports on produce, hay, grain, livestock, and cotton. Bulletins are issued periodically by many large commercial houses for distribution among patrons. A portion of the information contained in these house bulletins is often sent by wire to important shippers who deal with the house in question. It will thus be seen that the farmer who lacks price information is not alive to the opportunities along this line.

Most of these quotation sheets give jobbing prices, and, unless otherwise specified, the reader should understand that the jobbing price is meant. Some of these reports give a fairly wide range of price. This tendency to include prices on all sales has sometimes caused these reports to be very indefinite. The producer who sees apples quoted at from $2 to $5 per barrel is little the wiser for this information. Most of the information, however, is fairly understandable and concise enough to give shippers a very fair idea of prevailing prices. Many inexperienced shippers do not understand the true functions of the price quotation. They have a tendency to ship to the market quoting the highest prices, forgetting that extra freight charges may offset the higher prices. The net return is the only safe basis of comparison. If the shipper will deduct freight charges before comparing prices on different markets, he may conclude that the market nearer home offers him a better outlet than the one further away which may happen to be quoting higher prices.

Prices of hay, grain, livestock, and certain other staple commodities are not as a rule subject to violent price fluctuation within short periods. The fruit and vegetable shipper should remember that prices on perishables may drop almost to the vanishing point within so short a period as 24 hours. For this reason the price quotation should not be used by the shipper as an absolute guide to prospective prices. These quotation sheets, however, are of very great assistance to the shipper who desires general market information and who wishes to be informed regarding general conditions prevailing in the principal markets to which he may ship.

Advertising

The nature of the farmer's business does not permit as extensive advertising as is employed by vendors of other utilities. The manufacturer or merchant who deals in nonperishable commodities has his advertising problem simplified by the fact that he is merchandising his wares the year round. The salesman who has a product which finds ready consumption throughout the entire year is better able to reap the cumulative effects of advertising. The farmer who usually has something to sell only during a short period each year finds it difficult to benefit materially from an advertising campaign. Grow-

FIG. 48. Field-sorting potatoes into three sizes. This results in a better-graded product and less handling later on.

ers, carlot shippers, and distributors are, however, just awakening to the possibilities of judicious publicity. One fruit growers' association in 1917 spent over $350,000 in advertising, and had plans for still more extensive campaigns to place its product before the eye of the consumer. Few associations and few growers can afford such expenditures, but may avail themselves in a more modest way of opportunities to interest purchasers in their wares. There are a number of openings for the farmer who deems it advisable to advertise. Many growers who are trying to sell direct to the consumer have found the circular to be a very good medium for publicity. The circular may be of the cheapest type and consist of one sheet printed on ordinary news-print paper, or it may be elaborated as an attractive, illustrated booklet. The latter is, of course, more expensive than the printed circular and can be used only where the value of the product is rather high.

Produce trade papers enjoy a very extensive circulation in trade circles and are the most important advertising media employed by commission houses or wholesale distributors. Space in these trade papers is frequently used by large carlot shippers who wish to attract the attention of wholesale buyers. Daily newspapers are often the means of stimulating demand in local markets. The producer who wishes to dispose of his product locally often finds a little space in the local newspaper to be a profitable investment.

Posters and stickers. Large posters are used to some extent in advertising the products of certain districts. Wholesale dealers often resort to this form of advertising when it is desired to stimulate demand for products which are meeting with indifferent sale. The poster has been used successfully by members of the wholesale trade in certain cities where campaigns have been inaugurated to clear the market of an oversupply of fruit.

Small stickers are often used by cantaloupe and watermelon shippers who wish to differentiate their product from the bulk of market offerings. The stickers attached direct to the melons are almost sure to be noticed by the consumer. Their use is increasing among producers who have high-class products for disposal.

The expense incident to agricultural advertising may vary greatly. The small producer will need to employ the cheapest medium, and practically every producer, no matter how small his output, can afford a small circular to be enclosed with his wares or mailed to his customers. Some large associations have found it profitable to secure expensive space in high-class periodicals. Naturally the individual grower can seldom employ such an expensive method of advertising. The most efficient and economical publicity campaigns are those waged by coöperative associations whose total output is sufficient to warrant the expense and whose membership is so large that the individual assessment is a minor consideration.

FIG. 49. Perishable products, such as fruit, need to be handled under shelter, but a simple packing shed can be easily and cheaply built in the field or orchard.

Very few growers realize the advertising value of an attractive or unique label or trademark. Some growers attribute their initial success to the attractiveness of their output. It will not pay to ship products of poor quality in fancy containers, but the grower who has a well-graded and standardized output will usually find it economical to add to its attractiveness by attaching thereto a neat, attractive label. A package which catches the eye of the consumer is much more salable than one which leaves a neutral impression on the mind of the passer-by.

General Marketing Information for the Farmer

It should be definitely understood that there is now available to the farmer a very considerable fund of specific commercial information. Most of the perplexing problems of marketing have been at least partially investigated and the results placed on permanent record. Almost any reasonable query can now be answered; and the producer who does not familiarize himself with existent information is placing upon himself a severe handicap.

The grower should not hesitate to consult the United States Department of Agriculture and the specialists in his State College of Agriculture. The primary function of these organizations is to assist the farmer to a better knowledge of his industry. Should the regular printed bulletins not contain specific assistance, there should be no hesitation about writing for information to suit the problem at hand.

The industrial departments of many railroads are glad to advise with the shippers along their lines. In many instances these industrial or agricultural bureaus have saved thousands of dollars for shippers who were willing to follow instructions.

Commercial produce houses and trade papers depend for their existence on the prosperity of the producer. While biased by self-interest in some cases, the information disseminated by these factors is usually sound and reliable.

Too few of our farmers know how to ask for information. As a result, specific assistance cannot be given in many cases. First and foremost, the prospective shipper should advance his query early enough, so that he may have time to take advantage of the requested advice. Then, too, he should be specific. If the informant does not have all the facts in the case, he must either fail to answer or risk giving the wrong reply. Lastly, the farmer should not ask for information which he knows can be merely conjectural, or at least, if he does ask for it, he should give to it its true valuation.

Market Preferences

Persons experienced in fruit and produce marketing have long since recognized the fact that cities, like individuals, may have pronounced peculiarities with respect to a food supply. Undoubtedly market preferences play a very important part in fruit and produce marketing. Big distributors, doing an interstate business, recognize this fact and cater to the likes and dislikes of consuming centres. The producer may do likewise where he has a clear understanding of the subject. This understanding must in turn rest on a knowledge of the reason why one market will readily pay high prices for a commodity which will find an indifferent demand in another city 100 miles away.

MARKET PREFERENCES

City	Apples	Eggs	Meats	Vegetables
New York........	Red color. All good varieties. Medium to large sizes	White	Good demand for all grades of lamb and beef	All kinds sell well. Highest prices for extra fancy and out-of-season products.
Chicago..........	Red color. All good varieties. Medium size	Either color	Heavy demand for cheaper cuts	Good demand for all kinds; less active on out-of-season products.
Boston...........	Red color. Best varieties only. Medium to large	Brown	Good for spring lamb and better beef and pork cuts	High prices for out-of-season and extra fancy products.
Pittsburgh........	Red color preferred, but excellent for Grimes. All good varieties. Medium size	White as a rule	Good demand for ordinary cuts of beef and mutton	Good general market. Active demand for all classes of vegetables.
St. Louis.........	Red color. Ordinary varieties sell well, notably Ben Davis. Medium to small	Either color	Same as Pittsburgh	Good demand for staples, but will not pay high prices for out-of-season goods.
Kansas City......	Red color, but Grimes sell well. Most good varieties. Medium to small sizes	Brown	Demand for fairly good cuts	Stronger than St. Louis on high-priced products, but fairly limited demand for all except staples.
Minneapolis......	Red color. Excellent Jonathan market. Medium to large	Brown	Active demand for good cuts	Fairly good for fancy and out-of-season products.
Cincinnati........	Any color. Takes some indifferent varieties. Medium to small sizes	Either color	Lower grade or cheaper cuts demanded	Good for medium prices and staple products only.
Philadelphia......	Red color. Especially good for Staymans, Jonathans, and Winesaps. Medium	White as a rule	Demand good for good cuts	Fairly active on fancy stock.
Washington.......	Red color, but also good for green and yellow apples. Good varieties only. Large	White	Same as Philadelphia, but more active for more fancy stock	Good demand for fancy and out-of-season products.

Factors determining market likes and dislikes are: (*a*) popular habit; (*b*) character and class of local produce firms; (*c*) type of city and population; (*d*) business affiliations of local produce houses; and (*e*) prevailing seasonal prices.

The early source of supply has had a decided influence. Cities which formerly depended largely on territory producing extra fancy fruit have become accustomed to this quality and utilized much of it in spite of high prices.

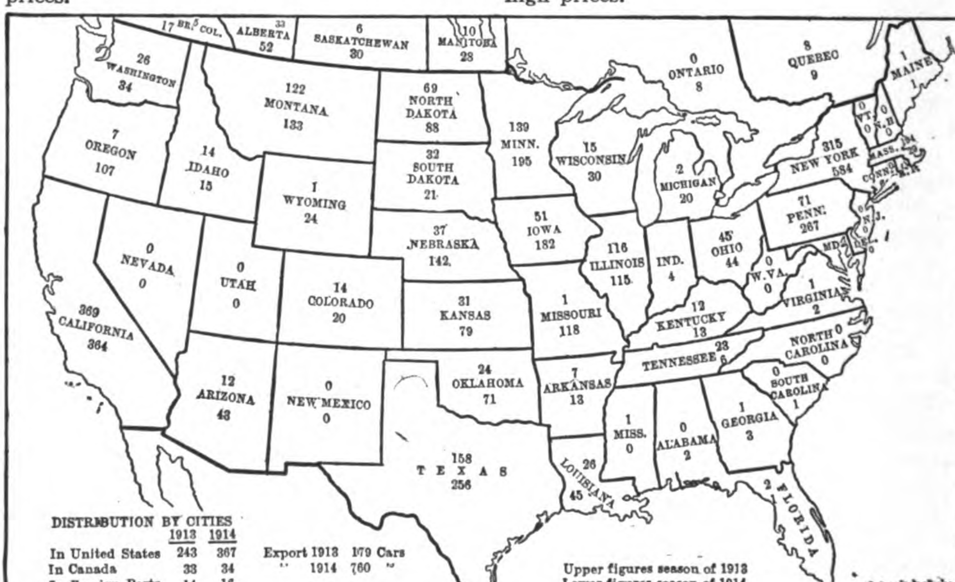


Fig. 50. Efficient carload distribution of apples as practised by a coöperative organization in the Northwest.

Habit is difficult to change, and those markets which early in their history developed a liking for certain classes of produce still show a marked preference for these grades or varieties.

Turning to a consideration of the type of distributing firms in various markets, we are confronted with the fact that the average producer is inadequately informed as to the character of the men who sell his produce. The public is much given to unquestioningly buying whatever is constantly displayed before them. The housewife too often accepts the judgment of the retailer, whether he be grocer, huckster, or fruit-stand man. The retailer in turn buys what he thinks will sell best, and thus the decision of the grocer or huckster helps to determine the character of the produce which will move in greatest quantity. If the retailer underestimates the quantity of extra fancy fruit which his customers may be induced to buy, the wholesaler will find little demand for the better grades. If the retailer finds that his customers desire only certain varieties, he will regulate his purchases accordingly. Soon the grower begins to realize that the returns from certain markets on certain classes of produce are uniformly unsatisfactory, and he begins to look elsewhere for an outlet for these commodities. The mental processes of the retailer may thus be said to be one of the primary reasons for market preferences. That this reasoning may in many instances be faulty or ill-advised is only to be expected. Many of the unexplained oddities of certain markets may be traced back to this foundation.

Causes of market preferences. Another basic cause of market preferences may be found in the fact that cities differ as greatly as individuals with respect to character and type. Most producers of perishable commodities know that certain cities are "cheap" markets, while others will take large quantities of the better grades and varieties. This, of course, is very fortunate, since there is an outlet for all classes of fruit. Markets which normally care for the cheaper grades and varieties usually pay more satisfactory prices for these grades than are obtainable in cities which demand the best. The apple growers of the Ozarks have thus learned to roll most of their Ganos, Yorks, and Ben Davises to Texas markets, and to place their finest varieties in northern cities. Shippers in the Pacific Northwest, whose fruit is packed and graded under rigid rules, bill an appreciable portion to points as distant as New York City and Boston in order to place their fruit on a fancy market. For the purpose of this discussion, we may make a tentative division of American markets into three general classes: (1) Manufacturing cities; (2) cities which are banking and distributing centres and have a wide diversity of interests; (3) cosmopolitan cities which, because of their great

FIG. 51. Hand sorting potatoes at a reloading station near the city. Much labor and expense could be saved by careful sorting and grading at the producing point, as in Fig. 48. (Wis. Bulletin 256.)

size, embody all the characteristics of smaller places. Manufacturing towns may in turn be subdivided into those employing a relatively high percentage of skilled labor and those whose industries are served by a large army of lower paid employees. Detroit and Pittsburgh are cities having a comparatively highly paid and prosperous laboring class, and this condition is partially reflected in the quality of produce demanded in these cities. Both consume large quantities of foodstuffs, and both are good markets for fancy, well-graded farm products. The number of highly paid workers is not so great in either Cincinnati or St. Louis, and the predominance of the poorer working class manifests itself in the tone of the market. These cities utilize large quantities of products which might not sell to advantage on more fancy markets, and they pay therefor a price which compares favorably with prices received for better produce in other cities.

Boston, Cleveland, and Kansas City are cities which have a multiplicity of commercial interests. Cities of this class are usually fancy markets.

Certain markets, because of their great size, do not come entirely within either category. They consume large quantities of all grades and varieties, and their preferences do not have quite the significance which attaches to the likes and dislikes of smaller consuming centres. New York, Chicago, and Philadelphia are cosmopolitan in character and are used freely by shippers of all commodities. They are not exempt from the peculiarities of other markets, but their oddities are often lost in the ever-changing conditions obtaining in such cities.

In concluding a classification of different types of markets, it may be stated that one rule applies to all. Those cities having a native-born American population usually demand the better grades and varieties of farm products. Cities in which the foreign element is prominent prefer, as a rule, the

FIG. 52. Samples of cull potatoes sorted out at a reloading station (Fig. 51). Someone paid the freight on this waste material and the price of the edible stock will have to be increased to make up for it. (Wis. Bulletin 256.)

cheaper grades and are willing to pay fair prices for products which are nearly unsalable in the fancier markets.

"Fancy" markets. Trade arrangements in many cities have a decided influence on the development of market peculiarities. The wholesale produce business in many of our smaller markets is largely controlled by one or two local firms. These in turn have trade connections in producing areas, and the character of these connections helps to determine what shall be offered for sale in greatest quantities. Markets whose principal distributors look for their supply to districts well known for their output of fancy fruit soon become accustomed to this class of fruit and are known as "fancy" markets. Big distributors in other cities find their most desirable connections in districts producing less fancy products and their market gradually learns to consume the cheaper varieties and grades and becomes known as a cheap market. This classification is not intended as a reflection on the cheaper market nor on the people who purchase on this market. It is necessary to realize that only a small percentage of the farm products of this country can be classed as extra fancy. If it were not for the preference of some big distributing centres for the lower and cheaper grades, it is to be feared that the producer would more often find himself with a balance on the wrong side.

It is both difficult and unreasonable to divide American markets into arbitrary divisions and state that certain markets will take only certain varieties while others demand something entirely different. Market preferences are not quite so pronounced in actual practice. As a rule any of the larger distributing centres will handle practically everything that is marketable. It is distinctly unsafe to decide that only certain markets will take certain varieties or grades. An assumption of this kind may close some very satisfactory outlets for farm products. The importance of placing products on those markets which are best fitted to handle the same can hardly be overestimated; but, in the light of present knowledge, it is not safe to draw hard and fast conclusions. Market preferences in many cases have been established on an unscientific basis and are too often the result of habit or accident. It is a regrettable fact that these peculiarities have developed to their present importance. If this development is not arrested, the producer of the future may need a guide book in looking for a market. The remedy for these conditions lies in educating the consuming public to a realization of the fact that they are depriving themselves of many of those things which make for better living.

The table on page 66 has been prepared as a brief index of some of the preferences which now exist in certain of our more important markets. It should be understood that this table does not profess to be a complete guide for shippers using these markets. The fact that red apples are preferred by practically all American markets does not mean that many of these cities are not excellent markets for the disposal of yellow or green varieties. As a matter of fact, the better light-colored apples, such as Grimes and Greening, find a ready sale on practically every market in the United States. The table, however, does indicate certain facts regarding the special preferences of these cities which may assist growers in looking for satisfactory outlets.

FIG. 53. Tenant houses on a large, successful dairy farm. Clean, well-built, comfortable quarters induce help to stay in one place and make their work count

CHAPTER 5

Farm Owners, Farm Tenants, Farm Employees, and the Relations Between Them

By H. C. TAYLOR, *Chief, Office of Farm Management, U. S. Department of Agriculture, and formerly Professor of Agricultural Economics in the University of Wisconsin, who has made a special study of the relations between those who own farms, those who rent them, and those who work upon them under varying arrangements as to payments and profits. One man may think of farm tenancy as one of the greatest and most difficult of our rural problems; another may see it as a great opportunity for the ambitious young farmer of limited means. Depending upon the degree to which, and the way in which, it is developed, both may be partly right and partly wrong. So, too, with the question of long- or short-term leases, the rights of the owner in relation to the duties of the manager, etc. Every such problem is difficult and ever different because it deals with human factors and personalities. But at the bottom are certain truths and principles, and it is of these that Professor Taylor writes.*—EDITOR.

Landownership on the Part of Farmers

THE advantages of ownership. To own the farm on which he lives and works is not only a source of great satisfaction to the farmer, but it stimulates the kind of farming which, in the long run, is most desirable socially and most profitable to the individual.

Ownership is important for a great many reasons, of which the following seven may be enumerated here:

(1) It takes time for one to become acquainted with his neighbors and to establish mutually helpful relations with them. Without the goodwill of the neighborhood, it is difficult to organize a crew for threshing grain, cutting silage, or any other job requiring a large crew of men for a short time.

(2) It takes time to establish credit relations and to learn how to buy and sell. Credit is based upon known character and ability. The man who must move from place to place may have these qualities and yet have little credit, because he has not had time to establish this fact in the minds of the business men of the community. It also takes time for one to establish a reputation for producing goods of high quality, for which top prices may be paid without fear that less obvious qualities may be lacking.

(3) Another advantage of permanency of tenure is thorough acquaintance

with the soil. Different soils require different management; and only by close acquaintance with them can one know how to treat them so as to secure the best results. What crops have been grown on each field, what fertilizers have been applied and when, are facts that must be known as a basis for planning the cropping system and the tillage methods for the years to come; and these facts only the permanent operator can always know.

(4) The goodwill of the soil is as important to the farmer as the goodwill of his neighbours. It is only by right treatment through a series of years that the soil is brought into good tilth and becomes well supplied with organic matter stocked with the bacteria which directly or indirectly prepare the food for the plants. Without permanent interest in the soil, the farmer may plow the land too wet, and thus break down the flocculency of the clay particles in the soil, reducing materially the annual crops; he may leave the cattle on the fields when the ground is wet and produce the same effect; or he may fail to destroy the scattering weeds in the cornfield, which will have but slight effect upon the present crop, but which will mature thousands of seeds every one of which will do its best to occupy the land and defeat the farmer in his efforts the next year. *Good farming is cumulative;* hence permanency of occupation is essential to the best success. Once the soil is in good tilth and free from weeds, less labor is required per acre, one man can operate more acres, and the yields per acre are larger. Good field culture is usually the result not of more labor, but of *good management and high quality of labor on the same land for a long period.* It is generally believed that ownership alone gives the permanence of tenure which justifies the farmer in introducing the best types of field management.

(5) The effect of ownership is even more obvious when farm buildings and fences are considered. The attitude of mind of the owner toward these semipermanent improvements determines their rate of depreciation. A nail driven in the right place at the right time often saves a barn door from ruin; a little paint applied by the farmer's hand makes the barns last longer and look 50 per cent better. The amount of labor required to keep the buildings and fences in repair is, of course, considerable; but it can be done at times when field or livestock work is making light demands upon time, and is thus not subtracted from the time which may be employed in the directly productive enterprises of the farm. Without the stimulus of property rights in these buildings, etc., and without permanence of tenure, few men are disposed to use their available time in caring for these improvements.

(6) In the livestock districts, the building up of a herd is a task which requires long-continued effort. It might be possible to succeed in building up a dairy herd of high quality without the permanence of tenure which is se-

FIG. 54. The pride of ownership reflects itself clearly in the type and upkeep of farm buildings. The man who owns a home and expects to leave it to his children has reason enough to make and keep it comfortable and attractive

cured by ownership, but it is seldom done in this country. The farmer who moves from farm to farm can take his cattle with him, but he cannot be sure of proper equipments for caring for them. This uncertainty discourages the long-time policy required in the successful breeding of livestock.

(7) Another advantage of owning land is the effect it has upon the accumulation of wealth by the farmer. The land is a safe savings bank, one from which the investor draws a return in money and in direct satisfaction. It is the desire to rise to the position of a free owner of a farm that stimulates the thrift which makes farmers the greatest of all working people to accumulate wealth.

MEANS OF ACQUIRING LANDOWNERSHIP. **Free land.** The relative importance of the various methods of securing land changes as a nation grows older. In the past, when government land could be had for the asking, it was easy for anyone willing to undergo the hardships of pioneer life to secure property rights in land. This has had an important influence upon the farmers of the United States. But in these days free land is of vanishing importance, and other methods of acquiring land are becoming more important.

Gift and inheritance. Many young farmers are so fortunate as to have parents or other relatives give them farms. It is a matter of common observation in the United States that farmers who are able often assist their sons in buying land. Often the home farm is greatly enlarged by the purchase of adjoining or nearby land during the period when the boys are helping operate the farm, and then, when one by one the boys are ready to farm on their own account, the process of division begins, or a new purchase of land is made and turned over to the member of the family ready to establish a home. What gift begins, inheritance completes; and in these 2 ways vast sums of wealth pass from generation to generation.

Unfortunately, the influence of gift and inheritance is greatly limited by the movement from country to city. This movement carries vast sums of farm-earned money to the cities. A farmer and his family move to the city. The farm is sold. The entire price must be earned, saved, and transferred to the city man's account in order to put the ownership of this land again in the name of the one who cultivates it. This movement has been very rapid in recent years and has been a large factor in the decline of the number of landowning farmers.

As a general rule, the greater the amount of land and other forms of wealth acquired by one generation and transmitted to the farmers of the next, and the more evenly this wealth is distributed, the greater the ease with which the ownership of land may be acquired by the succeeding generations of farmers. But the larger the percentage of each generation which seeks city occupations, the greater the amount of wealth which will be

FIG. 55. Tenancy—especially short-term tenancy—offers little chance and less incentive to beautify the home. Too many houses on rented farms are not kept up because they are not worth keeping up.

drawn from agriculture into other industries by gift and inheritance, and the smaller the part which inheritance will play in the acquisition of landownership.

Savings as a means of acquiring land. Prices of farm products tend to be such that the less efficient farmer can get a living from his industry. Where and when this is true, all the more efficient men who produce at a lower cost and sell at the same price secure a profit and are able to earn an income beyond what they feel obliged to spend upon their living, from which they can save money and invest it in land. The farm surveys which have been made in recent years show a wide range in the savable incomes which farmers receive. The wider the range of efficiency of farmers, the more important will profits become as a source of savings. The more nearly farmers are equally efficient, the more nearly will they as a class spend their incomes, and the smaller will be the savings available for buying land. Education brings out differences, ignorance reduces men to a common level; hence, education is a means of promoting profits in agriculture and of maintaining the landowning farmer.

Credit. A good credit system promotes landownership among farmers, by enabling them to buy land before they have the full purchase price. A good credit system should provide the young farmer with a profitable and safe investment for his savings prior to the date when he is ready to buy land, and, later, loan him funds within safe limits when the purchase is finally made. The third important consideration in a land credit system is the provision for a long-time period in which to wipe off the debt and a gradual proc-

ess of repayments. These 3 considerations are provided for in the present Federal law, which, with minor improvements which experience will doubtless indicate, will help to put the American farmer in a safe position when borrowing money on land. The difficulty in the past has been that the borrower was too much at the mercy of the lender. The new system eliminates the personal factor, and standardizes the farm-loan business to the benefit, it is hoped, of all concerned. In Germany, where a similar system of land credits has long been in use, landownership on the part of farmers is more common than in the United States, though indebtedness is much greater, which implies that a good credit system reduces tenancy and promotes ownership among farmers.

Farm Renting

Many a young farmer who owns no land, and who would otherwise be required to remain in the employ of another farmer, finds it highly advantageous to invest his savings in the equipment necessary to operate a farm and to secure the use of a farm under a lease. This gives the young man a chance to gain, and to realize upon his ability as a manager as well as upon his skill as a workman. This enables him also to marry at an earlier age with a chance to rise gradually to the position where he can buy a farm, whereas the married hired man has little chance to rise. Experience proves tenancy to be an important stepping-stone to a better condition in most parts of the United States. Many tenants benefit by the advice of wise and helpful landlords.

In comparison with landownership, the tenancy system has its disadvantages, the most important of which are uncertain tenure, lack of incentive to take care of the soil, buildings, etc., which are noted under the advantages of ownership. Where compensation for unexhausted improvements is provided, as in England, these evils are largely overcome; but the fact of tenancy implies a man too short of funds to own the physical basis of his industry; and the one satisfactory system is landownership, toward which nearly all tenants in the United States are striving. While many landlords are helpful to their tenants, others are suspicious, fretful, bickering, stingy, ignorant men who are a drag on the energies of the tenant.

FORMS OF TENANCY. The short-term lease. This form of lease is very common in the United States, a vast number of farms being let for one year at a time. Many farms are let for terms of from 3 to 5 years, but longer terms are rare. It often happens that the tenant who has a contract for 1 year only will remain on the same farm for a long series of years. In this case, he comes to know the farm; but, even then, he has not the incentive to lay out his energy in improving the tilth of the soil and destroying the weeds with a view to less work and better crops in future years. If the long-time point of view is to be introduced into the mind of the short-term tenant, he must be promised continuous possession so long as he farms in a satisfactory manner, and, in addition, in case he leaves the farm, compensation for improvements which he has made and has not had time to realize upon. This is the way in which the "year-to-year" tenancies have been made tolerable in England.

The long-term lease. This lease, extending over a period of 19 or 21 years, has been looked upon as a means of giving a permanency of tenure which will stimulate good farming. In England, 100 years ago, the long lease was widely heralded as the one condition of intensive farming; but experience has resulted in the abandonment of the long lease in favour of year-to-year tenancies *with compensation for unexhausted improvements and payment to the tenant for disturbance, in case he is asked to vacate the farm.*

The long lease was found unsatisfactory in England because: (a) The tenants exhausted the soil during the last years of the lease, leaving the farm in such a state that several years were required to put it again in condition to yield profits. (b) Changes in prices during the term of the lease resulted in the rent being too low during periods of rising prices and too high during periods of falling prices. The former discouraged the landlords in using 21-year leases, and the latter "broke" the farmers and left many farms untenanted.

The long lease is not favored in the United States, for the reason that most landlords are retired farmers who expect their farms to be sold in a few years, and most tenants expect to remain only a few years on leased land before they buy a farm.

Cash rentals. Cash leases are universal in England, which is the classic land of tenant farming, but in the United States cash rentals are less common than share rentals. Of the 2,354,676 tenant farmers in the United States in 1910, 1,399,923 were share tenants, 128,466 were share-cash tenants, 712,294 were cash tenants, and 113,993 were unspecified.

Cash rent is usually preferred by tenants who have plenty of capital and enough experience to act independently of the landlord. This independence is highly prized by many tenants. Cash tenancy encourages a more intensive culture than share tenancy, because all of the extra annual product due to better culture goes to him who stands the cost of this culture, whereas the share tenant gets only a part of this extra product. In general, it is believed that the experienced tenant can make more money on a cash-rental basis than on shares.

As a rule, landlords who are not close at hand to look after their farms find it better to rent for cash. This guarantees the landlord a definite amount of rent, and while the total receipts of the landlord are probably lower than a well-managed share system will yield, yet the fact that the trouble is less and the risk is less makes many owners content to rent for cash.

Farming land on shares. This method has many advantages. The risk is less for the tenant. The amount of capital required is less where the landlord furnishes a part of the equipment. The young tenant benefits by the advice of the landlord, who has retired from his farm and who best knows its possibilities. Landlords take more interest in putting in good improvements on share-rented than on cash-rented farms.

The disadvantages of share tenancy arise when landlords and tenants fail to agree on the management of the farm, or when either party fails to live up to his agreement. The danger is that the tenant who furnishes all the labor will slight the work, to save expenses or even in order to be idle. The landlord, on the other hand, often looks upon the tenant as free labor, and expects more than is reasonable in the way of intensive cultivation of the land and care of the livestock.

The methods of letting land on shares are so varied that a brief description of the forms of share tenancy is essential to an understanding of the subject. Share tenancies vary with respect to (a) the proportion of the product received by each party; (b) the equipment and supplies furnished by each party; and (c) the degree or extent of control that is exercised by each party.

The fourth system. One fourth the product is the lowest share rent which can be said to exist to any great extent in the United States. This system is found on the western edge of the wheat region of the Dakotas, Nebraska, and Kansas, and also in Oregon and California. In general, it may be said that the fourth system exists in the North only on relatively unproductive lands. In the South, the practice of giving the landlord one fourth of the cotton crop is very common wherever white tenants engage in cotton production. It is here most generally found in conjunction with a "third" system for the grain crops. It is common in the South to speak of the "third and fourth" system, which usually means that the landlord receives one fourth of the cotton and one third of the grain crops.

In the fourth system the tenant usually furnishes all the equipment and seeds, but, in case commercial fertilizer is used, as is sometimes the practice in the cotton country, the landlord pays one fourth the cost of it. In the northern states, the landlord often furnishes nothing but the bare land for one fourth of the crop.

Under the fourth system the tenant is usually left free to produce the crops as he pleases, the landlord exercising little control beyond the determination of the crops to be grown and the area of each.

The third system. The one-third system is very common throughout the United States except in the regions of very high land values in the north-central states. Under this sys-

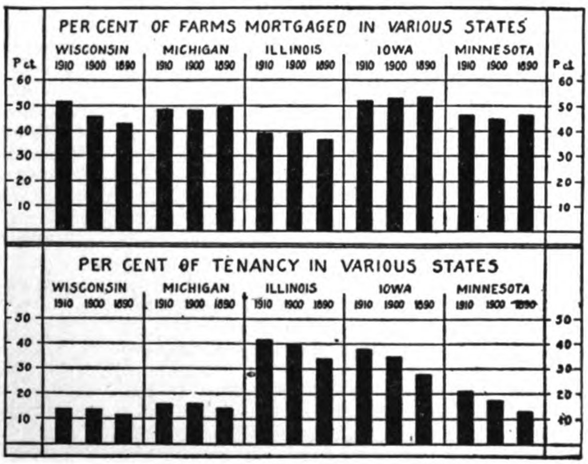


FIG. 56. Neither tenancy nor the farm mortgage is necessarily a sign of poor farming; much depends upon why and how a farm is mortgaged, and under what conditions it is rented. Where land is high-priced, as in Illinois, many a good farmer makes his start as a tenant. In newly developed territory, as in Wisconsin, a mortgage is often a wholly legitimate means of supporting a newly cleared farm until it becomes self-supporting. (Wis. Bulletin 247.)

FIG. 57. Frequent changes of location waste the tenant's time and energy and result in poorly cared-for farms

tem, the landlord receives one third the grain and, sometimes, he receives all the straw and cornstalks and stands none of the expense of production.

The landlord receiving a third of the produce usually furnishes none of the operating equipment of the farm. In many instances, the tenant pays a cash rental for the house in which he lives and for pasture for his livestock. In many other cases, fields only are rented for one third the crop. The tenant, in such cases, lives on the land which he may have bought or leased, and takes two thirds the grain and leaves the roughage on the farm where grown. Where the third system exists with respect to grain crops, the hay crop is usually shared half and half.

Where land is rented for one third the crop, the landlord usually controls in detail the kind of crops to be grown on each field. Beyond this, he leaves the tenant to do much as he pleases.

The two-fifths system. In the corn belt the two-fifths system has been an intermediate stage in the rise of share rents from one third to one half the crop. This system differs from the third system primarily in the fact that the landlord receives two fifths of the grain, and the tenant receives three fifths of the grain, straw, and corn fodder. The system is usually the same as the one-third system, so far as what the landlord furnishes is concerned, and also with regard to control.

The half-share system. The letting of land for one half the product is found in all parts of the United States. The half-and-half system varies greatly with respect to what the landlord furnishes in addition to the land and buildings.

Grain farming on the half system. In one form of half-share tenancy, found in the grain regions of Minnesota, Kansas, Nebraska, the Dakotas, and in the wheat regions of the Pacific Coast, the landlord furnishes the seed grain and gets one half the crop. In these regions, it is often considered that one half the crop, with the landlord furnishing the seed, is equivalent to one third the crop where the landlord does not furnish the seed.

In central Illinois and in west-central Indiana, the landlord who receives one half the grain crops furnishes nothing but the land and buildings, and exacts a cash rental for the land used for hay and pasture. The exacting of a cash rental for hay and pasture land often accompanies the share system in the north-central states, also, where the landlord receives one third or two fifths, as well as where he receives one half of the crop. In the South, corn land is sometimes let for cash, while cotton land is let on shares. In central Illinois, the landlord sometimes demands half the grain and $1 per acre in addition, and it is the regular thing to require that the tenant deliver the landlord's share of the grain at the nearest market at such time as the landlord may desire to dispose of his share of the product. It is in the heart of the corn belt of central Illinois that the landlords are able to make the heaviest demands upon their tenants.

In eastern Ohio, in Pennsylvania, Maryland, and some adjoining territory where wheat has long been considered central in the farming system, the landlord who receives one half of the grain lets the tenant have the use of the buildings, the hay and pasture land, and all the straw he cares to feed on the farm, without any additional compensation. This custom is held to rather tenaciously, and in one instance the writer found a tenant who was making about $100 a month from his dairy. This was appreciably more than the entire value of the grown crops and yet the landlord continued to accept one half of the grain and let the tenant have all he made out of the dairy.

The land-and-stock share system. Another form of the half-and-half system is the land-and-stock share system, in which the landlord furnishes a part of the livestock or owns a half interest in all or a part of the livestock. This system is most common in the dairy regions of New York, Ohio, Illinois, Wisconsin, Iowa, and Minnesota. The variations are numerous, but the system has many features which are quite general. The landlord furnishes the land and buildings, including the house for the tenant. The ten-

FIG. 58. Undervalued, neglected machinery is an all too common sight on tenant farms, especially where the owner supplies the equipment.

ant furnishes the horses, tools, machinery, and all the labor required to operate the farm. The landlord and tenant own jointly the cattle, hogs, and poultry kept on the farm.

The items of expense are likewise in three classes. The landlord furnishes material for making repairs, and the tenant performs the work, unless a skilled workman is required, in which case the landlord pays for the mechanic. The tenant stands all expenses in keeping his horses, tools, and machinery in working order. Expenses for twine, threshing, silage cutting, etc. are usually shared equally. The dairy equipment is often owned jointly. This refers especially to the cream separator, shipping cans, etc.

A common variation of this system is for the landlord to furnish all the cows. This is more or less common on the less valuable dairy farms of Wisconsin, and is common in New York.

Tobacco and cotton croppers. The form of half-share tenancy found in the tobacco and cotton regions of the United States is very simple. The landlord furnishes the land, buildings, teams, tools, and other equipment, and often advances the tenant enough goods, money, or credit to live on while making the crop. The tenant, or cropper, as he is commonly called, furnishes the labor required to produce and harvest the crop. The cotton cropper receives one half the value of his crops and free house rent and garden as pay for his efforts. In many of the cotton regions, the cropper is not an independent operator, and overseers ride about over the estate or plantation and direct the cultivation from seedtime until harvest.

Two-thirds system. Here and there throughout the northern states is found a farm on which the landlord furnishes everything but the labour, and receives two thirds of the produce of the farm, while the tenant, or share hand, as he is more properly called, furnishes all the man labor, and receives one third of the proceeds of the farm. While this system is found widely scattered, it is not believed to be common.

SOME THINGS A LEASE SHOULD COVER. There should always be a lease or agreement drawn, agreed to, and signed by both parties before the tenant takes possession of the premises. Whether the document is ever referred to again or not, it is important to go carefully over all the points regarding which differences of interest may result in disagreements. The lease should describe: (1) the land and buildings to be furnished by the landlord; (2) the uses to which the land may be put; (3) the additions and repairs to buildings which the landlord will make and the time the work is to be done; (4) the livestock and other equipment or share in the same which each party is to furnish; (5) the kind of farming which is to be carried on; (6) the character of payment (cash or share) and the amount or proportion to be paid as rent; (7) what the tenant is to do in making repairs and in helping with new buildings; (8) who is to pay the following: taxes on farm, taxes on jointly owned livestock and equipment, the threshing bill, the twine bill, the ensilage-cutting bill, the shredding bill, the corn-shelling bill, and the cost of hauling the products to market.

The aim should be to project the mind through the activities of the years for which the lease is drawn and to state who is to furnish each thing needed, what may be done and what not, who is to do each thing to be done and who is to settle each bill which must be paid.

Form of a cash lease. The proper form of a cash lease is as follows:

"This Indenture, made this .... day of .... A. D. 19.., between Earl E. Johnston party of the first part, and Geo. H. Thompson party of the second part,

"Witnesseth, That the party of the first part, in consideration of the covenants of the party of the second part, hereinafter set forth, does by these presents lease to the party of the second part the following described property, to wit:

....

....

in the .... county of .... and state of ....

"To have and to hold the same, to the party of the second part, from the .... day of .... 19.., to the .... day of .... 19... And the party of the second part, in consideration of the leasing the premises as above set forth, covenants and agrees with the party of the first part to pay the party of the first part, at .... as rent for the same, the sum of .... dollars, payable as follows, to wit:

....

. . . . And further to do all the work and perform all of the covenants hereinafter mentioned, as part of said rent.

"And the party of the second part covenants with the party of the first part that at the expiration of the term of this lease he will yield up the premises to the party of the first part, without further notice, in as good condition as when the same were entered upon by the party of the second part, loss by fire or inevitable accident and ordinary wear excepted.

"It is further agreed by the party of the second part, that neither he nor . . . . legal representatives will underlet said premises, or any part thereof, or assign this lease, without the written assent of the party of the first part had thereto.

"And it is further expressly agreed between the parties hereto, that if default shall be made in the payment of the rent above reserved, or any part thereof, or any of the covenants or agreements herein contained to be kept by the party of the second part, it shall be lawful for the party of the first part or . . . . legal representatives to enter into and upon said premises, or any part thereof, either with or without process of law, to reënter and repossess the same at the election of the party of the first part, and to distrain for any rent that may be due thereon upon any property belonging to the party of the second part. And, in order to enforce a forfeiture for non-payment of rent, it shall not be necessary to make a demand on the same day the rent shall become due, but a failure to pay the same at the place aforesaid, or a demand and a refusal to pay on the same day or at any time or any subsequent day shall be sufficient; and after such default shall be made, the party of the second part and all persons in possession under . . . . shall be guilty of a forcible detainer of said premises under the statute.

"Said party of the second part further agrees that he will, at his own expense, during the continuance of this lease, keep said premises, fences, and every part thereof, well built up and in repair; that he will cultivate the land well, plowing it at least four times, and fall plow to kill weeds; to kill and weed out all cockleburs and other noxious weeds; mow the roads and cut all the weeds by buildings, hedges, and fences in and around the land he tends, and haul out all the manure and spread it on the poorest land; that he will trim and plash the hedge, at the proper time and in a workmanlike manner, in and around all land leased; hedge on all outer lines to be kept not higher than four and a half feet and to be trimmed at least once each year, not later than February 20, such hedge being trimmed so as to fully comply with the law; or, if he fail, said Johnston may hire it done at his expense, if not done in time, as before agreed; and that he will keep up his hogs and be responsible for all damage they may do; that he will rotate his crops, alternating with corn, small grain, and grass, sowing grass seed as said Johnston may require; that said Johnston may enter and improve, at any time he may see proper; and fix fence, fall plow, build, etc. He also agrees to sow in small grain and grass all but forty acres of corn to each hand and team, and also to look after, and be responsible for any waste in, said Johnston's property in the place. And he also agrees not to set out any fire or put any ashes about the buildings to endanger insurance, or any dirt about the buildings in spring, or anything to subject said Johnston to damages.

"It is further agreed by the said party of the second part, that as further rent for said premises, he will haul upon said premises, and upon the lands as designated by said Johnston . . . . full loads of manure; or in default of hauling said number of loads before the . . . . day of . . . . 19. . . . will pay to said Johnston \$. . . . . for each load not so hauled. That he will also mow all the spots of weeds and grass in the fields and around the hedges and buildings, and in the roads adjoining said land, the full space of . . . . days before the weeds are ripe; and in default shall pay to said Johnston \$. . . . . for each day's failure. Said party of the second part further agrees to make all repairs upon said premises at his own expense, and at the expiration of this lease to leave them on the premises, agreeing to remove nothing without the written consent of said Johnston; and that he will keep his cattle from eating the hedge or doing any damage.

"And it is expressly understood and agreed that the said party of the second part will promptly and faithfully perform each and every one of the special clauses of this lease, and in case of his failure so to do, at the proper time, in the proper manner, and to the full extent, he hereby agrees that said Johnston may hire the work to be done by competent parties, who are hereby given permission to enter upon said premises for the purpose of doing such work; and all sums paid by said Johnston on account thereof shall be added to the principal amount agreed to be paid herein, and shall become due and payable on the . . . . day of . . . . 19. . .

"And it is further covenanted and agreed between the parties aforesaid, that no pasture or meadow land shall be broken up without the written consent of the said Johnston. . . . .
. . . .
. . . .

"The covenants herein shall extend to all and be binding upon the heirs, executors, and administrators of the parties to this Lease.

"Witness the hands and seals of the parties aforesaid, the day and year first above written.

....................Seal.
....................Seal."
....

In Mississippi, the forms used in contracting with croppers on a cotton plantation are as follows:

"I hereby agree to cultivate ( ) acres of land, on that part of the .... plantation known as...... during the year ( ) under the direction and supervision of the owner, ... or his agent. I agree to gather and house the same in good condition, for which service I am to receive one half the crop.

Signed .... (cropper).
Witness...........
Date ...."

Another used on a large Washington County plantation is a little more detailed; it reads:

"This Contract, Made this (*Date*) and terminating one year hence, between D. and D., and .... witnesseth: That D. and D. have this day set apart to him for the year 19.., certain ...... acres of land on D. and D. Plantation, Washington County, Mississippi, to be worked by him on 'Shares'; he also agrees to plant and cultivate all land allotted to him, including the edges of roads, turnrows, and ditch banks, and to keep the latter clean, and to plant no gardens or truck patches in his field; and that he will not neglect, leave, or turn back his crop until entirely gathered, and that if he should leave same, he will thereby forfeit all right he may have therein.

"Witness our signatures, this the .... day of .... 19..

"Witness:— ....
....................."

In a combined lease and partnership, the following covenants are entered into:

"This indenture made this .... day of March, 19.., between .... of the city of ...., county of ...., state of ...., party of the first part and .... of said city, county, and state, party of the second part.

"Witnesseth that ...., party of the first part, agrees to let his farm, etc. (Here follows the description of the farm which consists of .... acres of arable land and .... acres of pasture land), to .... party of the second part.

"It is agreed between these contracting parties, that they are to jointly buy and own all personal property (except horses, tools, and machinery) that is needed and used in conducting operations on this farm, including cattle, sheep, hogs, poultry, seeds, and feeds of all kinds required in operating the farm, and share alike equally all profits and losses resulting from same.

"It is agreed that the said party of the second part is to furnish all the horses, harness, tools, and machinery needed in operating the farm and to perform or pay for the performance of all labor used in conducting operations on said farm except it be for the repairing or painting of buildings which the party of the first part must be holden for unless they be minor repairs.

"Also that said party of the second part is to build and keep in good repair all fences on said farm, all the material used for same to be furnished at the nearest market by party of first part at his own expense.

"Also all grass seeds are to be furnished by party of the first part.

"Also that said party of the first part is to pay all taxes on realty, and the taxes on personal property are to be paid jointly. Also that the work horses are to be fed out of undivided hay and grain, except in case the party of the second part should desire to do teaming for his own profit in which case he shall feed team from his own hay and grain, also the number of work horses shall be limited to ......, and should colts be raised they shall be the common property of owner and tenant.

"Also the bill for threshing grain or seeds, for binder twine and ensilage cutting shall be paid jointly.

"It is agreed also that all ditches forming on the land are to be properly filled at the proper time by the party of the second part.

"Also that all noxious weeds are to be cut at the proper time and the weeds of any description on the highways adjoining the above described land are to be cut to the middle of the road by party of the second part.

"Also the party of the second part agrees to haul out and distribute upon said farm, at places most needed, all manure made thereon, and at such times and at such places as shall be designated by the landlord.

"Also all dead trees in the grove to be used by party of the second part for firewood, if he wants the same, also all refuse from buildings and fences not fit for use again.

"Also all brush and weeds of any description, growing along the rows on said farm to be kept cut by party of the second part.

"It is further agreed that no stock shall be allowed in the pastures or meadows while the frost is leaving the ground or until the ground is fairly settled.

"Also that no grain or feed is to be sold off the above farm without the consent of both parties to this contract.

"It is further agreed by and between said parties that all corn fodder, straw, and other rough feed raised upon said farm and not fed

out at the expiration of this compact is to be the property of the landlord.

"Also that when stock or grain, wool, poultry, or dairy products are sold they shall be delivered on the market by the tenant.

"Said party of the first part also reserves the privilege of plowing the stubble or stalk ground on said premises when said party of the second part may have secured the crops or grain grown thereon, and may enter on said premises at any time for purposes of improvement, or for any reasonable purpose which said party of the first part may deem proper.

"And it is further understood and agreed that if party of the second part shall abandon said premises, or shall fail from any cause to comply with all his agreements herein, the said party of the first part may at any time, when such abandonment or failure occurs, take actual possession of said premises and buildings thereon, which said party of the second part agrees to surrender, and said first party may employ other persons to tend said crop and harvest or gather the same, and may remove and sell the same at public or private sale and apply the proceeds thereof to the expense and cost of carrying out the provisions of this lease and the payment of said rent hereby reserved, and all advances, and if the proceeds of the crops as aforesaid shall not be sufficient to repay said first parties all the money so expended, the said party of the second part agrees to refund to said parties of the first part such deficiency on demand out of any other property belonging to the said second party.

"And it is further expressly agreed between the parties hereto, that if any default shall be made of any of the covenants and agreements herein contained to be kept by party of the second part, this lease shall at the election of the parties of the first part be null and void.

"Also that the said lease of the above described land is to run from March .... 19.., for the term of .... years, and at the termination of said lease, should a dissolution be agreed upon, all personal property is to be equally divided between said parties. In cases of hay and grain the division is to be made by measurements, each party receiving one half of each grade of the products to be divided. In the case of livestock to be divided, the party of the second part shall divide each class of cattle, sheep, hogs and poultry into two lots, and the party of the first part shall take his choice of lots, the party of the second part accepting the remaining lot of each class of stock as his share of the livestock.

"Witness our signatures this the .... day of ....19....

....

...................."

Hired Managers and Workmen

Farm owner and hired manager. The relation between the farm owner and the hired manager should be one of mutual confidence and understanding. The general policy of the farm should be laid down clearly by the owner, and it should be the duty of the manager to carry out faithfully the details of such policy so laid down, using his own discretion where unforeseen events arise.

The details of management, the programme of the day, the hiring and discharging of subordinates, the calling of the veterinarian, etc., should be left to the manager, who should always make his decisions on the basis of the best interests of the farm so far as they are consistent with the honest and humane treatment of men and beasts. The manager on a definite wage basis must take great care to keep his own personal interests in the background, wherever they conflict with the successful operation of the farm. The operation of a farm by a hired manager is the least successful system of farming in use in the United States.

The most successful farm organization is found where the farmer and his family do all the work. The management is usually the result of family conferences held about the dining table, in which everyone has his say and the father makes the final decisions. In some families, the danger is that the growing children will work too hard; but in many other families the danger is that the children will not do enough work and will grow up without developing industrious habits.

In farming, especially in livestock farming, there are so many details which require the careful attention of interested workers that the ordinary irrespon-

sible wage worker is almost useless. The family organization gives control over the family labor when necessary, and the community of ownership of the proceeds gives interest to each worker in securing good results.

FIG. 59. While there are frequent exceptions, it may generally be noted that a region in which short-term tenancy is common, is characterized by poor roads, and the various undesirable conditions (such as poor schools and churches) that accompany them.

The farmer and the hired man. Whenever the family does not meet the demands for labor, the effort should be to employ men who will become coherent parts of what may be called an "artificial farm family." To some farmers, this may seem objectionable. If this be so, it is recommended that the size of the farm be reduced to correspond to the family labor force. The hired man is usually a young man, unmarried. The farmstead is an isolated centre of life and industry. All who participate in the industry of the farm should be privileged to participate in the life of the farm home. The artificial family established, the hired member should have his say in the management of the farm, as do the original members of the family. This engenders interest in his work, and results in the more faithful carrying out of details, as well as the putting forth of great effort in times of emergencies, and the general goodwill and comity of the group.

Transient labor. On specialized wheat farms, for example, the demand for labor in the harvest and threshing season is much greater than at any other season of the year. The specialized wheat farm which is large enough to use the family labor during the remainder of the year cannot be operated without extra labor in caring for the crop. This makes a demand for transient labor. Transient laborers are as a class undesirable citizens. The type of farming which encourages this class should be avoided. Where wheat is grown in rotation with other crops which are fed to livestock, the demand for labor is more evenly distributed through the year, so that more nearly all the labor can find continuous employment on the farm. This is the important means of holding men of character and ability.

Exchange labor. The most satisfactory method of securing the large crew of men required for threshing grain or cutting ensilage is to exchange work with the neighbors. It has been said that exchange labor is not subject to control and that many men are inclined to shirk. There are neighborhoods where this is true, but there are other neighborhoods where the workmen compete with each other in winning praise for both the quality and the quantity of work done. At their worst, exchange laborers are as good as transient laborers, and they have an especial advantage for the farmer in that they do not have to be lodged, do not arrive until after breakfast, and they go home if the work has necessarily to be stopped for a day or so because of rain or a broken machine. The transient must be lodged and fed whether the work moves on or not. Furthermore, the transient may leave at any moment without provision for anyone to take his place.

Sharing profits. Sharing profits without sharing risks is not common in this country. The one profit-sharing system which works is share renting. Here both parties participate and both share in the good or bad results of the year's operations. Profit sharing with managers and workmen has been tried in various forms, but with no marked success. The difficulty of knowing what the profits are makes it hard to adjust the payment. A more satisfactory plan is for the owner to pay standard wages, and then pay each man a bonus according to merit. It is believed that such bonuses should never be pointed to as an inducement for men to remain or to work harder. The bonus should be an unclaimed gift freely given and joyously received. A bonus of a few dollars from time to time closely associated with overtime or the exercise of good judgment in a crisis is always helpful.

FIG. 60. A community of owned farms, on the other hand, is usually marked by better-kept-up homesteads, better roads connecting them, better schools and meeting places and, in general, a spirit of greater progress and social advancement.

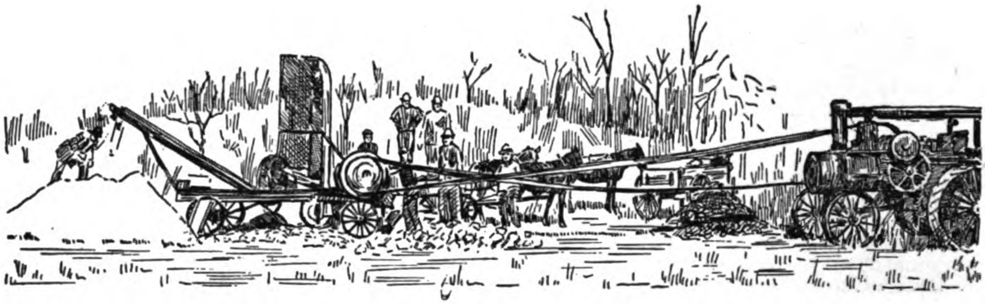


FIG. 61. A coöperatively owned and operated limestone crusher and shell grinder. With such a machine, a group of farmers can benefit their own farms and make a comfortable profit by helping others to do the same

CHAPTER 6
Coöperation in Farming

By JOHN LEE COULTER, *Dean of the College of Agriculture and Director of the Agricultural Experiment Station of West Virginia, who was born on the farm, lived there until past 20 years of age, and has since devoted 99 per cent of his efforts in the direction of actual farm operations, assisting farmers generally to improve their conditions. He has taught in the Iowa State College and the Universities of Wisconsin and Minnesota; he was special agent in charge of the Division of Agriculture of the U. S. Census in 1910–12; and he was a member, and the secretary, of the commission sent to Europe to investigate rural credit and coöperation. Thus he formerly gave much of his time to special problems of coöperation; during recent years he has broadened his field to include consideration of all farm problems. As Dean of the State College he has supervision over the operation and development of 6 separate farms totaling some 2,000 acres and representing poultry, livestock, fruit and truck, dairy, field crop and general farm activities each carried on according to the most up-to-date, successful methods. He has organized coöperation organizations and carried them to permanent success; he has visited practically every country in the world and all parts of this country in studying coöperative and agricultural conditions generally. A more thoroughly informed, more deeply interested, more widely experienced authority could not be found to discuss this tremendously important subject.*—EDITOR.

COÖPERATION as a word in common use outside of the field of agriculture is, when used literally, a very general term. It means merely "working together." The working together may be in the form of a definite and permanent association or organization or it may be informal and temporary. During recent years, the word has been given a very special meaning, particularly in the field of agriculture. Here it means more and more the formal organized working together on the part of country people with a definite purpose in mind. But in country life, as in life generally, there probably is as much informal as formal coöperation.

In any careful attempt to identify all forms of coöperation there should be definitely recognized: (1) Local, temporary informal coöperation without any special organization; (2) local, formal coöperation in the form of clubs, rings, circles, societies, associations, etc. for some local benefit or improvement; (3) formal business coöperative societies, in contrast with formal business corporations; (4) farmers' organizations for educational, social, and general advancement of the rural life in general; and (5) compulsory legal coöperation.

Compulsory legal coöperation. It will not be necessary to take much time to describe the fifth type of coöperation, yet it is as important as, or more important than, any of the other types. A good illustration of compulsory legal coöperation is found in our system of free

schools which now prevails in practically all parts of the country, rural and urban. The majority of the people, coöperating through representatives in legislative bodies, pass rules and regulations dividing the nation into states and the states into counties or parishes; setting aside cities, towns, and villages; and further dividing incorporated places into wards or other units, and dividing rural territory into townships, magisterial districts, precincts, or some other practical unit in order to perfect a system of compulsory legal coöperation. As a result of this division, school districts are maintained and all of the citizens of the community coöperate both in the support of the schools created and in the benefits derived from them. Generally, there is no direct relation between the cost to the individual in the form of taxes and the benefits derived. The largest property owner and the largest taxpayer may have the fewest children and may directly gain little from this compulsory coöperation with neighbors, while the home with the largest number of children, securing the greatest direct benefit, may contribute the least for the maintenance and support of the schools. It is the belief, however, of the great majority of democratic society that the indirect benefits which come to all equalize matters sufficiently, so that it seems wise throughout the length and breadth of the United States to continue to maintain this system of compulsory coöperation.

It may be worth while to give a second illustration of compulsory coöperation; this is found in the establishment and maintenance of the road systems of country districts and the street systems of cities, towns, and villages. Every reader will call to mind the coöperative arrangement by which roads and streets are planned, established, and maintained.

Our church and Sunday school systems. Closely related to the above illustrations of compulsory legal coöperation, and yet without any of the legal features and without any compulsion, is the complete system of churches and Sunday schools maintained throughout the length and breadth of our land. Probably there is not a city, town, or village, and not a rural community with a dozen families where the most thorough system of coöperation for the maintenance of a church or a Sunday school is not found. Coöperation for the establishment, maintenance, and operation of churches and Sunday schools is brought in here only because it is universal and not because it is compulsory or established by legal action. Yet, it is the best illustration of coöperation carried out universally in this great democracy on a purely voluntary basis, and is probably the best example of coöperation of the fourth class referred to above. Details need not be given. Students and advocates of coöperation in farming would do well to make a thorough study of the operation of our school, road, and church systems, if they would understand and most successfully develop other phases of coöperation.

Organizations for social and general betterment. As we turn now to other organizations in agriculture aiming at educational, social, and general rural betterment, we find a long list of movements which give us a basis of study indicating what the future should be. Going back to colonial days, even then there were agricultural associations. Some of these carried on supplementary works outside of the educational and social. Some were interested in the agricultural press and started our first farm papers. Some interested themselves in fairs and exhibits; some, in the introduction of better seeds, better plants, better animals, better tools, implements, and machines, and better agricultural practices. Even before 1860 some took up the problem of distributing the products of the farms and devoted most of their attention to the problem of marketing. Prior to the middle of the last century (1850), however, there was, outside of the organizations for schools, roads, and churches, no great national association of country people to deal with the special problems of country people. By 1867 this movement had begun, and since that time the rural United States has shown its ability to organize for general rural development. Mention may be made here only of such organizations as the National Grange, the New England and National leagues, the Agricultural Wheel, the Farmers' Mutual Benefit Association, the Farmers' and the Citizens' alliances, the Farmers' Educational and Coöperative Union, the Society of Equity, the Gleaners, and some others of the past as well as of the present day, which, however, are far more completely organized for purely business purposes than for educational, social, and general rural improvement. It is not to be understood that the organizations named above were established purely for educational

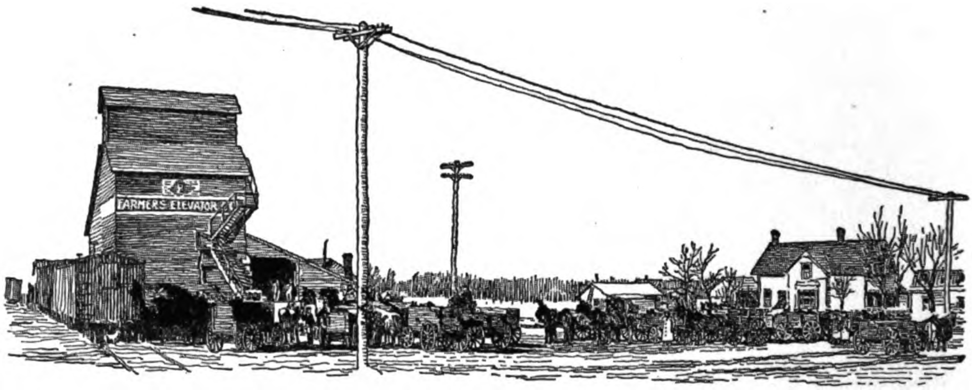


FIG. 62. A farmer's coöperative elevator company in Minnesota that handles seeds, coal, salt, posts, fencing, flour, and feeds as well as grain. The aid and loyalty of its stockholders is at the bottom of its success

and social purposes; some have had, and still have, the characteristics of a lodge, while others added many types of business organization and some engaged in political activities. Some have lived throughout the entire period, at times growing stronger and at times, through some error of policy, becoming weaker. The genius of organization and improvement through coöperation, both formal and informal, is fully illustrated in this great movement for the general upbuilding and improvement of country life. It may be said, taking the whole situation by and large, that the inclination on the part of rural people to coöperate has increased from decade to decade, and at the present time membership in some rural organization is more nearly the rule than the exception in many parts of the country, especially where most farmers are landowners and where the country is well settled.

During the earlier period of our country's growth the general organization, such as an agricultural society with many functions, predominated, whereas the special agricultural society with a specific purpose was the exception. This is only natural, yet it marks one of the fundamental reasons why great progress, improvement, and benefit were not secured in the earlier period and why, during the later years and in the future, the benefits increased and will increase, the possibilities for improvement being unlimited. Probably the greatest reason for the success of the coöperation which resulted in the schools, churches, and roads, is the fact that those interested got together for a definite purpose and did not allow any other activity to interfere. At the same time, it may be said that much of our failure in later years is due to the fact that the groups have attempted to cover too many things and some or all have been neglected, resulting in failure.

Coöperative organizations for special purposes. One of the striking characteristics of the last half-century was the development, perfection, and permanent establishment of coöperative organizations for special purposes, which have proved their worth and, in the future, will prove more and more their usefulness. This group of activities includes the various livestock breeders' associations, including the many poultry and bee keepers' societies. It also includes special organizations, such as the fruit growers', wool raisers', grain improvement, and cow testing societies. This great group of coöperative organizations have in mind almost entirely, or at least primarily, the improvement of agriculture from the standpoints of better, more uniform, and higher production. In some cases it is a greater yield through better seeds, better animals, or better plants; in others it is a greater yield through better care, treatment, or management; in still others it is a better

product, such as finer animals, better fruits, better wool, or better cotton. All of these are representative of specialized coöperation in farming. They have evolved from the more general agricultural organizations of the earlier period, and seem to point clearly in the right direction. There can be no doubt that, with gradual perfection and organization, coöperation will bring to the farmers of this country an improvement in production in agriculture which could not have been secured in any other way.

It may be said that these types of coöperation are forms which are only temporary; that they supplement the educational institutions of the past, and will disappear with the perfection of the agricultural educational institutions of the future. It is even the ambition of some leaders in the educational world, with the introduction of formal agriculture in the elementary schools and now in the high schools as a result of the Federal Smith-Hughes Act, and with the development of each college of agriculture with its great arm extending out all over the state in the form of the extension service, that all of these special agricultural associations shall be consolidated into general and special coöperative bureaus, each coextensive with some political unit such as the county or parish. There is, indeed, much to be said in favor of the correlation of all of these coöperative activities into coöperative county and state federations. The success of this federation and standardization will, however, long depend upon freedom of membership, the independence of choice on the part of farmers and their families, and the absence of anything which has the appearance of compulsory membership. It is also extremely important that each activity be kept free and independent with a chance to win a way for itself.

While the school systems, both elementary and high, will surely be maintained with a large element of universal requirements, such as compulsory attendance during certain seasons of the year, the genius of the rural population of our country must be given opportunity of expression in the supplementary work of improving itself through voluntary coöperation in the form of associations for the improvement of the rural territory. The most that the educational institutions can do through boys', girls', men's, and women's clubs, through fairs, institutes, extension schools, reading circles, demonstrations, rallies, and the like, is to supplement the formal school systems and place at the disposal of the rural population the very latest and the very best. It will be, and should be, many years, if ever, before these voluntary organizations of rural folk will be standardized and forced into a uniform mold similar to the schools. Rather they must follow the voluntary movement of the churches, where freedom of development should and must prevail.

Informal community coöperation. Passing for a moment the formal organization of those engaged in agriculture for purposes of rural insurance, the selling of their products, and the buying of supplies, and examining the informal local community movements, we enter a great field illustrating the genius of the rural people of America for coöperation for mutual advantage and benefit. This informal community coöperation takes many forms. A good illustration of this is the old-time barn raising, the husking bee, the quilting party, the silo filling, and the canning party. Unlimited examples could be given of this informal local temporary community coöperative movement. In this same group might be included other spontaneous organization. In nearly every community of our country boys form baseball teams or organize for other sports. The same may be said of girls who are now organizing clubs, such as the Camp Fire Girls. We see this also in the spontaneous getting together of groups of country people for basket socials, dancing parties, sleighing parties, and the like.

This all brings us to the final group, which is most commonly brought forward when the subject of coöperation in farming is considered. This group includes coöperation among groups of neighbours living upon farms for the establishment of a rural telephone system, for the establishment of a blacksmith shop, for the ownership of some important piece of machinery, for the organization and operation of a mutual insurance company, for the establishment and operation of storage buildings, such as elevators and warehouses, for the organization and operation of manufacturing establishments, such as cheese

FIG. 63. A group of competing elevators in a section where coöperation is yet to be established. Contrast with Fig. 62 and think of the waste in duplicated buildings and labor, and the lessened profits on account of the splitting up of the returns.

factories, creameries, and condenseries, for the making of cider and vinegar or the ownership of a press for making sirup or the operation of a plant for canning, preserving, or drying fruits and vegetables, and, finally, coöperation for the selling of the products of the farms, including their standardized grading, sorting, weighing and packing, and for the buying of supplies needed in the operation of farms. This last great group is primarily the great field of business coöperation in contrast to the system which might pre-

vail, namely, that of depending entirely upon outside parties to own and operate institutions which farmers might patronize. The question of the exact form of operation, which is quite a different one from that of the purpose of the organization, is discussed below, under the section "How farmers can coöperate."

What Coöperation Does

The coöperation which resulted in the establishment of a complete school system has meant uniform popular education, and this in turn has meant the success of democracy. Without this universal coöperation on the part of all of the people, the American nation might very well have been not unlike the Russian nation with 15 per cent of its population educated and the other 85 per cent illiterate. In turn, without this coöperation and universal education, it would have been impossible to maintain democracy. This nation would certainly have changed into some form of government controlled either by a powerful, favored few (an *oligarchy*) or by financial interests (a *plutocracy*) or by an educated upper class or aristocracy. It cannot be said that this is not a true and fair presentation of the effect of universal coöperation. The only unfair feature of this form of coöperation is the fact that the few who oppose and object to it are compelled to continue their coöperation by the great majority. The few parents who do not wish to send their children to school are compelled to do so by the great majority, and the few children who do not wish to go to school are similarly compelled to go. The result is a form of universal coöperation which is the foundation stone of the democracy.

Coöperation and our road system. The value of coöperation in the establishment and maintenance of a good road system is self-evident. Here, again, the great majority of the people have determined upon the establishment of roads through coöperative organization; and, in order to make it effective, the whole thing has been systematized into the form of laws. Good roads make possible community association; and it may be said that universal coöperation for the establishment of roads was the preliminary step toward better transportation, better communication, and better education (through the establishment of schools).

The danger of emphasizing universal coöperation in the building and maintenance of roads and schools is that some may feel that this is not true coöperation because the majority compels the minority to concur in its actions; it would perhaps be better to cite our system of churches and Sunday schools as the ideal illustration of universal coöperation. Nearly every family in the United States of its own free will and accord is associated with some church and, through that church, with some Sunday school. This is coöperation of the truest type. It is purely voluntary, since no family need belong to any church. The greatest freedom of action exists. The purpose of the coöperation is in some ways very definite and in other ways very indefinite. The success of our whole religious system is an evidence of the universal willingness of the people to join together for some definite aim. In this connection it is very significant that all do not belong to one church—that there are a number of different churches represented in most communities. This would seem to indicate that no perfect, ultimate, finally successful type has yet been established. The individuality and independence of human minds has here an admirable opportunity to work out further plans or programs which seem best to them.

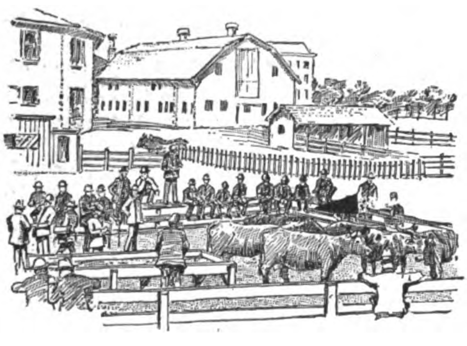


FIG. 64. Local meetings and conventions of cattlemen are often the starting points of, and sometimes the outgrowths from, coöperative movements. In either case the result is a highly desirable one.

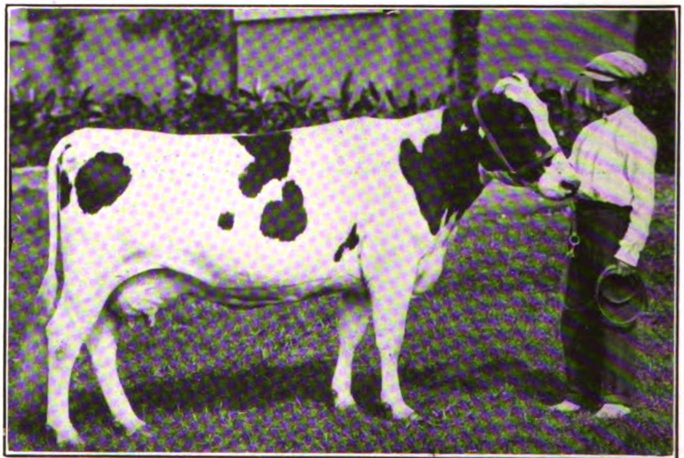
It is best, however, not to lay too much stress upon coöperation in the establishment of religious institutions, because, while this is practically universal and purely voluntary, it is possible for a large number of different groups to coöperate successfully and survive in the same community. In the matter of

Lettuce on a southern truck farm which typifies the producing end of the farm business

South Water Street, Chicago—one of the largest and busiest of the world's distributing centres for farm produce—is an example of the consuming end

Too Often the Farmer's Knowledge of His Part in the Business of Food Production is Developed at the Expense of a Knowledge of the Other End. He Must be a Salesman, Too

This animal is dirty, and the poorly chosen background fails to bring out its desirable conformation.



This is a good picture of a good animal well-groomed and well-posed against a good background. It tells the truth, and in an attractive manner.

The flanks of this cow, being much nearer the camera than the head, are distorted and out of proportion, weakening the entire effect.

Careful Photography is an Invaluable Factor in Successful, Modern Livestock Advertising. (Courtesy Holstein-Friesian Association of America)

many other types of coöperative endeavor an understanding of 2 great facts is necessary: (1) it is out of the question to provide plans whereby the majority shall compel the minority to participate; and (2) it is impossible to maintain two or more competing institutions of the same type in the same community. The success, then, of the widest and best coöperation in many fields will depend upon the ability of the great majority—without compulsion and without duplication—to establish successful coöperative enterprise. While it may be said that progress in coöperation during the last 100 years in this country in this third great field has not been great, nevertheless it has been far beyond anything which might have been predicted or could reasonably have been expected.

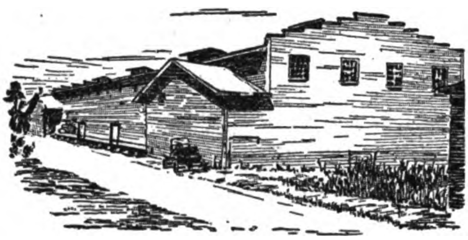


FIG. 65. A coöperative fruit packing and storage house in the Northwest. What a single farmer cannot afford to do can often be done by a score working in unison, with increased profits as well as lessened costs for each. (U. S. Bureau of Markets.)

The best measure of what coöperation does for its adherents and, to a lesser degree, for all neighboring families, is the general betterment of rural conditions as a whole. Travel the country over and, almost without any knowledge of the presence or absence of coöperative societies, one may detect when he enters a community where coöperative societies prevail. Coöperation for one object almost always means coöperation for another. For instance, coöperation in the establishment of a creamery will be followed by organization for the marketing of its product, and this will successively be followed by organizations for the marketing of other products, the purchase of supplies, and the establishment of telephones. Probably there will follow mutual insurance coöperation, and almost certainly a coöperative rural credit association. The sum total of these will mean the uplift or building up of the entire community. As, however, the upbuilding of a community is possible only through the upbuilding of the individual farms and homes, it may be said that the first problem for each community is to determine which is the most pressing form of coöperative enterprise, realizing that, as shown above, this will undoubtedly be followed by other forms all tending to the betterment of the community.

Coöperation can be successful only when it does concrete things. The first coöperative enterprise must have for its object the most practical, concrete thing and work for a definite useful result. A community with 100 farmers, having on the average 5 milk cows, located too far from a city to sell fresh milk, will form a coöperative butter-manufacturing establishment (creamery). The concrete thing which coöperation will do here will be: first, relieve 100 farm homes from the difficult and laborious task of making butter. The creamery will do this for 100 families. One man employed by these 100 families will do the job. This is similar to the employment of a teacher by 100 families to teach their children, thus relieving the mother and father of this responsibility. It is similar to the coöperative arrangement whereby 100 families unite in the employment of a preacher and the construction of a church. The second concrete thing will be the relief of 100 kitchens of the churn and 100 homes of the butter-making equipment, thus simplifying the tasks of the housewives. In order to do this, one kitchen, called a "creamery," will be constructed. The third concrete thing will be the fact that 100 various types of butter, differing only slightly, to be sure, but none the less differing, will be replaced by one standard type, probably as good as the best and slightly better than the butter made by the other 99. In this way the standard is raised materially. Direct results of this improvement are evidenced in the fact that during a year this one creamery may produce and have for sale 100,000 to 150,000 pounds of uniform high-grade butter which it can market in large quantities and in this way make very great economies. In this connection the creamery can secure a better market than could any one of the 100 families. The creamery will also get a better price for its butter than it was pos-

sible for the individual family to secure. With this better market and better price will come prestige.

Connected with all of this is the fact that one creamery can advertise not only its own product, but the community as a whole, so that, if the community has other products to sell, these other products will in turn bring higher prices. It is unnecessary here to attempt to give all of the economies and concrete benefits of a successful coöperative creamery, such as the saving to the 100 families in the purchase of butter-making equipment, of salt, etc. It is more than likely that the creamery will get a larger actual yield of butter because of better equipment and better methods. While the coöperative creamery has been employed here for purposes of illustration, one might with equal propriety have used the coöperative cheese factory or a coöperative establishment for making condensed milk, or coöperation for purposes of canning, preserving, or drying farm products, or it might have been better to have used as an illustration, a coöperative organization for the storage of farm products such as the coöperative elevator or warehouse. The coöperative creamery was used, however, because it is gaining such a definite and successful position in rural life in certain sections of the United States. If the coöperative cheese factory had been used as an illustration, it would have been better to refer to 50 families, each with 5 cows, since a cheese factory may be successfully operated with a considerably smaller number of cows than can an establishment for the making of butter.

Coöperation in farm production. In order to bring out some of the more important advantages of the different forms of successful coöperation, it is necessary to classify them into their different groups, and in that way to show their wide scope and great possibilities. Probably the type first in importance, from the standpoint of successful agriculture, is coöperation in farm production. This would include coöperation in the ownership of important tools, implements, and machines. It would also include coöperation in the ownership of very valuable breeding animals. In a community where the writer lived and farmed for many years, it was found advantageous to own one very large threshing outfit, including engine, water tanks, fuel wagons, separator, straw stacker, etc. It would have been a very great hardship, in fact it would have been almost impossible, for any one farmer to own and operate this outfit. In the first place it would cost nearly, if not quite, $5,000. It could be used only from 4 to 8 weeks each year. As no farmer could own this outfit, some outside business man would doubtless have purchased and operated it; but this would have meant very much higher charges to the farmers, since the owner who took over the risk would have expected to make reasonably good profits. The result was that a group of farmers got together and arranged to form a small company to purchase, care for, and operate the threshing outfit. They raised the necessary cash among themselves, and then each year charged regular rates for threshing. As rapidly as this money was collected, the labor was paid and repairs were taken care of. Each member paid the company for the threshing of his own grain. They threshed for a number of neighbors who were not members of the company. At the close of the year any surplus was divided among the members who owned the outfit in proportion to the amount which they had contributed originally to the purchase price. This plan worked very satisfactorily for several years and was changed only because the amount of grain produced in the district gradually declined and an increased acreage was devoted to pasture for livestock, the growing of hay and forage crops, the production of corn, etc. At this time much smaller machines were introduced,

Fig. 66. The coöperative creamery of Dassel, Minn., typifies the progress of that state in both dairying and coöperation. (U. S. Bureau of Markets.)

All over the United States will be found good examples of companies formed to own a very valuable stallion or bull, and in some European countries, especially parts of Belgium, Denmark, Holland, and several other countries literally thousands of communities have organized for this purpose. The same general plan described above in the case of the threshing outfit prevails. The only material difference between the two types of coöperation is that in the case of the threshing outfit or any other important tool, implement, or machine, it is usually unnecessary to employ a general manager or caretaker. Some member of the club may successfully and properly take charge of the enterprise, employ the engineer, fireman, and other laborers, and look after all of the business. The reason for this is that the outfit is in operation only at one special period of the year, or is transferred from one farm to another. In the case of a livestock breeders' association for the ownership of valuable breeding animals, it is very important that a regularly employed manager or caretaker be engaged, unless some one of the members has a very thoroughly organized, up-to-date farm and can do this satisfactorily to all concerned. Where only one animal is owned, this can frequently be done, but if the method pursued usually in Europe should be adopted, a regular caretaker should be employed. In traveling over Europe the writer found in nearly every case that a company of farmers would own any number from 5 to 10, 20, or even 30, special breeding animals of different ages. Sometimes these would be placed out on various farms and changed from farm to farm but they were under the direction and care and attention of a thoroughly trained livestock man.

In this same connection there should be considered another illustration of community coöperation in connection with the operation of the neighboring farms. In a community in Wisconsin a club of farmers found it very difficult to get blacksmith work satisfactorily attended to. There was the shoeing of horses, the repairing of implements and machinery, wagons, etc., the making of many small articles needed by the farmers, such as singletrees, etc. This club of farmers finally took hold of the proposition and found a young man who was well trained in blacksmithing and repair work. Having no capital, he was willing to be employed at a regular salary of $60 per month, provided a small cottage would be constructed for him to live in. The farmers formed a small company and raised slightly more than $2,000. With this they constructed the cottage and a small blacksmith's shop. During the first month, as a saving to the community, the young man was furnished with a team of horses and a wagon, and with these he went from farm to farm spending as much as a day with each farmer, and going over all of his old material lying about the farm. In this way several tons of old bolts, iron, and parts of machines, old broken tools, etc. were collected and assembled in the shop. This gave a good chance for the blacksmith to start his work. Of course he was compelled from time to time to buy materials. He kept very careful accounts on all articles purchased, and these were authorized each month at a meeting of the members. Each farmer was charged regular rates for his work done. From the receipts the blacksmith was paid his monthly wages and necessary material was purchased. For the first two or three years all of the surplus at the close of the year was invested in additional tools and equipment. At the end of this period it was found that the members could be charged a lower rate for all of their work, and on this account there has not been any material surplus since that time. The advantages to the farmers in this case are obvious. Not only do they have constantly one man on whom they may call for all repair work, but the work is done better and cheaper. Further than this, they own their own shop and find it a very profitable enterprise.

A coöperative laundry. It may, perhaps, be useful to give an example of community coöperation, having to do with the home itself. In a Minnesota community, it was found that one of the most unpleasant and difficult tasks in the management of the household was the problem of washing soiled garments, partly on account of the large number of laborers employed by the farmers and because of the fact that in most of the families there were many children. Along with this it may be noted that it was very difficult, in fact almost out of the question, to secure servants for the home, and that in a great many cases the farmers could not afford to employ servants. In this community the farmers themselves were already well organized and among other activities they had a coöperative creamery in a neighbouring town where each day the milk or cream was delivered from the farms. The creamery was built from brick and concrete and was a very modern plant. In connection with the creamery there was necessarily flowing water and this meant hot water and steam practically every day. The farmers' wives in this community took the matter up with their husbands and the result was that a small room was constructed in connection with the creamery to be used as a laundry, and the water and steam, together with the engine, from the creamery, were connected with it. It will readily be seen that a great burden was lifted from the backs of the women of this community. There was no cost of delivering or returning the clothes to or from the laundry, since that was done at the same time that the milk or cream was delivered. Since the

FIG. 67. A metal-sheathed farmer's elevator with connecting hollow-tile corn crib.

ironing was done at home after the clothes were returned, the cost was so small that all took advantage of it.

Coöperative elevators and warehouses. The second type of coöperation for business purposes would best be represented by coöperation in providing local rural storage for farm products. This would include elevators for the storage of grains, warehouses for that of cotton, wool, hay, and other farm materials, and cold-storage facilities for poultry, eggs, dairy products and other articles. A group of farmers in Iowa found that they did not have on their home farms sufficient space to store the grain produced, and that they could not afford to build sufficient storage on their farms, since most of the year the building would be empty. It was always very difficult to secure cars at the railway station or siding, and many individual farmers did not have sufficient grain of one kind and one grade to fill a car. The freight was excessive where a part carload was shipped, and the grade was reduced where two grades of grain were mixed in the same car. Many other difficulties and expenses were incurred because it often was difficult to haul the grain just at the right time. Finally, this group of farmers decided to build close to the railroad track an elevator in which the grain could be stored in bins, where it could be cleaned and graded, and from which it could be loaded directly into cars and shipped in carload lots. Each farmer, when he delivered his grain to the elevator, received a receipt stating the amount, kind, and grade of grain. He might immediately sell the grain at the price quoted for that day or he might hold it until a more satisfactory price could be secured. In this case a trained manager was employed, who had charge of the elevator throughout the year. The elevator was built sufficiently large to take care of 50,000 bushels of grain at one time. This, together with the storage on the farms and the fact that full carloads were constantly being shipped, made it possible for the farmers not only to secure better service, but also to secure a higher price without any increase in cost of the finished product to consumers. This elevator company continued to grow and thrive and it has been successfully operated for a great many years. As a result of this first effort, thousands of communities in twenty or more states have organized storage companies, and now elevators and warehouses are to be found scattered over many parts of the United States. This is one of the most successful types of coöperation now carried on by farmers in this country.

Livestock shipping associations. The third type of coöperation, which is somewhat different from the two already mentioned, is that form which has to do with the marketing of the products of the farm in their original form. This type probably would best be illustrated by livestock shipping associations, such as those found in some of the north-central states, or lamb clubs, which are a special form found in some of the Appalachian states, or fruit and vegetable (produce) exchanges such as are found in many states. Special forms are found scattered here and there in many corners of the country, such as the strawberry marketing of Kentucky, the organization among farmers in California to market their nuts, etc. These shipping associations and exchanges vary from the temporary local groups of farmers who come together once a year and list their lambs or hogs or livestock and call for sealed bids, after which a sale is completed, to the large, thoroughly organized, permanent exchanges such as the organization among fruit growers in California, or among vegetable growers on the Eastern Shore of Virginia and Maryland. In some cases the marketing organization is perfected even to the point of careful grading, sorting, standardizing, packing, and storage until the market demands the product. Since the method of procedure in all of these cases varies greatly according to the particular type of product to be sold, and according, therefore, to the state or section of the country involved, detailed descriptions might be misleading; and it would be better in each case for farmers interested to communicate with either the college of agriculture of their state or with the office of markets of the United States Department of Agriculture.

Since, in many cases, there is great advantage in changing the form of farm products before selling them, the fourth group would include farmers' manu-

facturing societies or associations. The best illustrations here would be the coöperative creamery, the cheese factory, the canning establishment, etc. In some states, such as Minnesota, the creamery predominates. Here nearly 1,000 communities have already organized in the establishment of local creameries. Farmers with 400 to 600 cows will raise from $4,000 to $6,000 and form a company for the construction and operation of a creamery. Uniformly the farmers themselves subscribe to the stock, even though in some cases they must borrow money in order to purchase their share. They elect officers from their own members, and select their own board of directors. In every case they employ trained buttermakers. So far has this movement proceeded that now these clubs of farmers have state meetings, and a state organization assists in the sale of the product of the local creamery in carload lots to distant markets. In other parts of the country, as in Wisconsin, the cheese factory predominates. Here a smaller number of farmers, with probably half as many cows, will construct a plant costing probably only about half as much as a creamery, and the same general plan of operation is carried out.

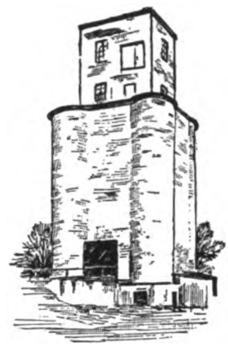


Fig. 68. A thoroughly modern concrete elevator owned coöperatively by Illinois farmers.

Coöperative purchasing associations. In this group of coöperative associations for business purposes, there should be included purchasing organizations, such as coöperative supply companies for securing machinery, fuel, fertilizer, feed, seed, and other general supplies needed in the operation of the farm such as spraying materials, packing materials, etc. Probably all of the companies organized for the operation of creameries, cheese factories, etc. purchase their salt, tubs, and other supplies in large quantities to advantage. In the same way the produce exchanges, such as the fruit societies of the West and those selling berries and grapes in the central and eastern states, as well as farmers along the Atlantic seaboard and the South who sell such produce as fruits and vegetables, secure great advantages in the purchase of boxes, barrels, baskets, crates, and other packing materials. In the section where farmers have companies for the operation of elevators and warehouses, the purchase of machinery, fuel, fertilizer, seeds, etc. is common. In some sections of the country where these more complete coöperative organizations do not yet exist, clubs of farmers in thousands of communities have perfected organizations for the purchase of fertilizer and, in some cases, of seed and other farm supplies. These last are the most informal forms of coöperation. In these cases frequently groups of farmers get together once or twice a year to discuss the amount of fertilizer needed and to place consolidated orders for a car or two. Some one member of the club acts as representative of the club to place the order and to notify all the members when the carload has arrived. This member may be paid 50 cents or $1 a ton to look after the work and check out the fertilizer from the cars as each farmer receives his share. Under this plan the farmer who looks after the ordering collects from each farmer and pays the fertilizer company for the entire amount. From the above it will be seen that purchasing societies of many types may be formed, according to the needs of the respective communities and it will also be seen that there already exist literally thousands of more or less definitely and permanently formed organizations for this purpose. Generally speaking, it may be said that this form of coöperation can best be carried on in connection with some of the other forms already referred to.

Closely related to the last-mentioned group comes the more difficult and probably less well-developed purchasing organization for supplying the household requirements of farm families. These organizations are generally referred to as coöperative stores. They are found very extensively in many European countries. In some they are widely known as Rochdale stores. They are also found scattered over the United States, although the number is not yet great. Here a group of farmers must necessarily organize a definite company and subscribe to stock in order to raise funds with which to build or secure the use of a store building, and to purchase the first general consignment of goods of all kinds, ranging from staple groceries through the wider range of boots and shoes and general merchandise. In this case a trained store manager or operator should be employed, and the most successful stores in this country, particularly in the north-central states and on the Pacific Coast, operate much the same as any general store, the difference being that the coöperative store is owned by the farmers and the store manager is employed by them. Where these stores are operated successfully farmers secure their supplies at a greatly reduced cost. Usually they pay regular prices for all of their supplies, but semiannually or annually receive a very substantial dividend in the form of a refund in proportion to the amount of their purchases. In these cases the members expect to receive interest at from 5 to 7 per cent on their money invested, all surplus being distributed in proportion to the amounts purchased.

It would not be proper to pass this phase of the great coöperative movement in farming without, at least, making mention of the great need for and possibilities of coöperation in other ways, if the farms, farm homes, and the community are to be built up and made better in every respect. I have in mind here such forms of coöperation as mutual insurance, the coöperative telephone, and the coöperative societies for purposes of securing credit. In connection with mutual insurance it should be noted that this may be limited to the insurance of farm buildings, or it may be extended to include livestock on farms and also farm crops in storage, such as hay, grain, etc. It will require a much wider organization than a community mutual to provide insurance against destruction of growing crops from hail or other destructive agencies. The same point may be made with reference to organizations for the purpose of securing better rural credit. All facilities are made available for farmers to organize under national supervision to secure long-term land mortgage credit, but farmers may similarly organize for the purpose of securing short-term personal credit for purposes of farm operation. It is important here to note that while the National Government is now prepared to assist farmers in the formation of rural credit associations, it is in no section of the country compulsory, as in the case of the school system. On the other hand, all in one community must belong to one organization, which is in striking contrast to the voluntary organization of churches and Sunday schools.

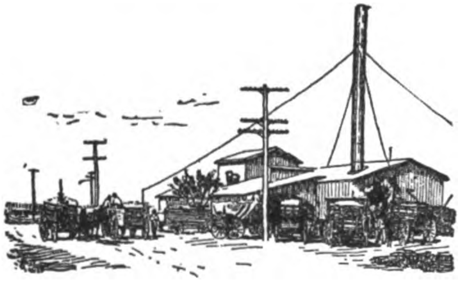


FIG. 69. A farmer's cotton gin. Even in the South, where innovations take root slowly, coöperation is establishing itself firmly and widely.

The entire coöperative movement, not only should have in mind and does have in mind, better farms, better homes, and better communities, as well as better business in farming, but also better local government and with this, in turn, a better state and national government, which means a greater, stronger, more permanent and better democracy.

How Farmers Can Coöperate

Successful coöperation depends upon the mental attitude of the people who are to become members of the organization. Just as some men are tall and some are short, so it may be said that some are naturally good coöperators and others are not. Each member must be not only willing, but anxious, to give and take. Selfishness must be overcome. The desire to get the best of a neighbor must be eliminated. The motto must, to a very large extent, be, "Each for all and all for each." The greatest success for the organization will be measured by the extent to which the members willingly adopt this motto and actively live up to it. Greater success will come from 10 farmers who have the inclination to coöperate and actively live up to their faith than from an organization of 20 farmers, each suspicious of the other's good intentions and willing or anxious to take advantage of the other, if an opportunity presents itself.

In any community the meeting of the minds of the people must be the starting point of coöperative organization. All must agree as to which is the most important, most practicable, and most useful form of coöperation for the community. After this question has been settled, and after a sufficient number of neighbors have become sufficiently acquainted to be sure that the coöperative mind or attitude is present, the actual organizing—the drawing up and adopting of articles of incorporation, constitution, and by-laws, and, finally, of rules and regulations for the government or management of the enterprise—all this is an easy matter. A letter to any college of agriculture, or to the Department of Agriculture at Washington, D. C., will bring sample copies of forms which may be used almost without change. Many collections have been made of forms which have been successfully used in hundreds of communities and these need not be reproduced here. Several good books on coöperation among farmers are available, some of which carry all necessary forms, blanks, sample constitutions, etc.

Organization should not be rushed. It is more important to devote weeks, even months, or a year or two, to the task of organizing and perfecting plans than to try to rush through these plans hastily and imperfectly at one brief meeting, in order to engage quickly in some form of coöperative enterprise. Probably more failures are due to haste in preparation than to any other cause. Too often a group of neighbors, called together on the spur of the moment, adopt something which is read, and immediately wish to see results. Unless they secure very large returns within the first few months, some are disappointed and fall by the wayside, others become discouraged and commence to complain. From years of experience, study, and observation, it is now positively established in my mind that patience, forbearance, and perseverance—all of which mean willingness to go slow and to lay a solid, permanent, and thorough foundation—are the fundamental necessities, if great results are to be secured in the long run.

Coöperation in farming for business purposes shows signs of 2 conflicting movements. Some forms of coöperation have for their aim the bringing back to the farmers of some of the work which they formerly had and which was taken away from them by the development and centralization of industrial enterprise; other forms aim to relieve the individual farm or farmer of tasks which he can clearly not perform most successfully or most economically. In the case of coöperative elevators, for instance, success is based upon the fact that individual farmers cannot most successfully or economically store their products on their own farms preliminary to placing them upon the market.

At the same time, it is based upon the confident belief that farmers can and should retain control and ownership of their products until the best time for marketing arrives. In other words, it is based upon the established belief that a better market can be secured and better prices received, if farmers do not immediately sell the products on their farms to outside parties, but rather that, if they will hold their products until the market is ready, more satisfactory results will be secured. The success of the coöperative creamery, cheese factory, cannery, etc. is based upon the well-established principle that the manufactured product—butter, cheese, canned vegetables, etc.—will be more uniform, better prepared, if made in a small local factory, than it will be if made on individual farms or even in great central establishments.

The whole success of the great new movement of coöperation in farming will be based upon successful analysis of the best form of organization in each case. In the matter of flour milling, meat packing, cloth making, etc., it will probably prove true in the long run that large central establishments are more economical and more efficient than small local establishments close to the farm. The larger central establishments will probably produce more cheaply and produce a better article and at the same time bring the finished product to the consumers at a lower price. In the matter of making butter, cheese, canned goods, etc. on the other hand, the local establishment, locally formed and operated, will probably be the more successful. This is all the more reason why time should be taken in each case in definitely determining the best program for each community.

Management of coöperative associations. As has been frequently said, what is everybody's business is nobody's business, and one of the first matters to be definitely decided by any group of farmers is the matter of management. The election or selection of officers and a board of directors for the new organization is one matter. These should be selected from the members themselves; and, in order to maintain a wise program, the membership should keep constantly advised of all details of organization and operation, and reasonable rotation in officers and directors among the members is desirable. All work by directors and officers, except in very special cases, should be performed without compensation. This is all the more reason why all members should actively interest themselves and why there should be reasonable rotation in office. This does not mean that a completely new board of directors and a completely new set of officers should be selected each year. Perpetuation of the organization demands gradual changes in office.

The employment of paid clerks, laborers, and a manager is a separate and distinct problem, and should be worked out with care. Probably the second great cause for failure of business coöperation in the past has been failure to understand the importance of this point. While officers and directors should be secured from members at all times, paid employees should be selected exclusively with one thought in mind—efficient operation of the new enterprise. If a creamery is to be established, a trained, experienced butter-maker should be employed; also, in the case of a cheese factory, a canning establishment, or an elevator for storage purposes, and so on. Just as a man cannot learn to do certain things successfully in a day, or a year, or even 5 years, so, too, the employees cannot be trained to do their special work efficiently in a few months or a year. Therefore, as far as possible, employees already trained in the work should be secured. In this same connection, whereas there should be reasonable rotation in office among directors and officers, this does not apply to such employees as clerks, laborers, and managers. Once a trained and efficient employee has been secured, he

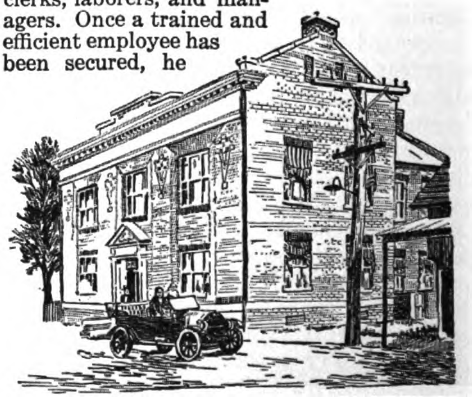


FIG. 70. The home office of the Eastern Shore of Virginia Produce Exchange, a vegetable growers' coöperative organization which has achieved noteworthy success. (U. S. Bureau of Markets.)

should be retained almost at any cost. Efficiency should be compensated to the limit; in other words, wages and salaries should be commensurate with labor performed. Too often a club of farmers organizing a coöperative association feel that it is good policy to employ one of their own members to manage the same. He, however, may not be trained in the special work to be done, and failure results. Again, a group of farmers decide to distribute employment by employing one member one year, another member a second year, and so on. This is even worse, since when one man has become proficient, he is dropped out and another untrained man is put in his place.

Coöperative organizations should be put on a definite business basis. This means definite bookkeeping and permanent records of all transactions, and, also, that if the manager employed has to handle any considerable amount of funds, he should be properly placed under bond to protect both himself and the organization. In addition, there should be regular quarterly, semiannual, or annual auditing of all books and accounts. This is only fair to the manager, and is necessary in order that the members may know constantly that good business methods are being followed. No other one thing will so entirely remove suspicion and eliminate doubt as an auditing by a trained specialist. Many a coöperative association falls to pieces as the result of unjustifiable criticism, doubt, fear, or lack of confidence on the part of some of its members. Even if there are only 25 members, it will be good business for them to contribute $1 each year for the employment of a trained auditor, or to set aside from the surplus a reasonable amount to pay for the inspection of the records.

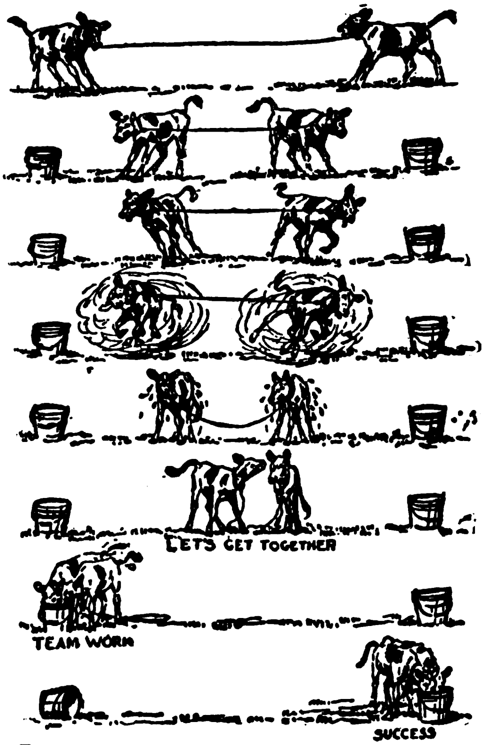


FIG. 71. A cartoon—of which the original source, being unknown, cannot be credited—which illustrates with both humor and accuracy the possibilities of coöperation.

Coöperation in farming has come to stay in America. The first great struggle was the organization on a democratic or coöperative basis of the government of the nation and its smaller communities. Following this came the development and perfection of voluntary coöperation in the establishment of our great system of churches and Sunday schools. Following these evidences of coöperation came the agreement on the part of the great masses of the people to establish a great school system. Gradually there developed from this the great movement for the establishment of roads, bridges, etc., which, also, is now all but universal.

It is not surprising that other great types of coöperation should be slow in developing; but that they are developing is evidence of the success and approval of their predecessors. They are rapidly increasing in number, improving in organization, and proving their value by standardizing products, by securing better markets, and in other ways by rendering service, not only to their members but to society at large. It may be many years before even a majority of all of the farmers in America will belong to one or more coöperative organizations. But here we should remember that the world has waited long for this great introduction of democracy in business; for, after all, coöperation is only a form or manifestation of the principle of democracy.

FIG. 72. A lookout station of the U. S. Forest Service in the mountains of the Southwest. (U. S. Forest Service.)

CHAPTER 7

The Farmer and the Law

By MRS. NELLIE E. FEALY, *of the United States Department of Agriculture, who has been a member of the staff of the Bureau of Plant Industry of that Department since its organization and actively identified with its growth. For several years Mrs. Fealy has been making a special study of a wide range of agricultural laws, and is the author of a Monograph on the Organization in the United States for Dealing with Plant Diseases and Plant Pests, which deals largely with laws affecting the farmer.*

There is a widespread tendency to think of law entirely as something prohibitive, something that limits the freedom of a person's actions. The truth is that laws are enacted mainly to safeguard and benefit the many, by establishing limits beyond which the few, willfully or unscrupulously, tend to go. Thus every farmer who is doing a legitimate business should feel that the quarantines, regulations, restrictions, etc. that in any way affect his activities are designed first of all to help him and to protect him from dishonest competitors, and careless, ignorant, or evilly disposed fellow farmers. Because the state and Federal governments may be centred far from his farm, is no sign that the laws they make are not just as individual, just as carefully thought out, and just as applicable to his conditions as those made by the authorities of his immediate neighborhood. Because they are not represented by uniformed police, is no sign that they are not just as important and just as active. On the contrary, indeed, the law, whether of village, town, country, state, or nation, is the farmer's friend, and as such deserves his sympathy and support. And that he may give it intelligent sympathy and support, he should also have a knowledge of what the law is, and what it does, and how it does it.—EDITOR.

THE Federal Government and the various states have numerous laws which affect the farmer directly or indirectly. In many cases both have laws on the same subjects; in some cases certain states have laws on subjects on which there is no national legislation, such as fertilizers, weeds, dairying, and certain questions pertaining to stock; and in still other cases the Federal statutes are not duplicated by those of the states, as in grain and cotton standardization, and some questions regarding land and irrigation and drainage.

The farmer is generally more familiar with the laws of his immediate locality and his state than with the Federal laws. However, the former are binding only on the citizens of such locality or state, and differ from those of other states and localities, whereas the laws of the Federal Government are binding on all citizens of the United States. Since all laws relating to any one subject have practically the same objects and are based on the same principles, the Federal laws will be discussed here to show the relation of the farmer to law as a whole.

Federal legislation, as it relates to agriculture and agricultural interests, may be divided into 7 classes, namely: general, educational, investigational, extension, regulatory, constructional, and financial.

General Legislation in Behalf of Agriculture

As agriculture developed in this country, there likewise developed the necessity of a Government clearing house, so to speak, for this branch of national industry. This necessity was met by the passage of the most important legislation that the Government has enacted in behalf of the farmer, that is the

ACT CREATING THE UNITED STATES DEPARTMENT OF AGRICULTURE. This Act was approved May 15, 1862. The Department carries on investigational, extension, and regulatory work, and includes within its scope practically every known phase of every problem with which the farmer has to deal. It is divided into 18 branches, each of which is made up of a number of divisions. These branches and their work as it affects the farmer may be very briefly described as follows:

1. **The Office of the Secretary.** The Secretary of Agriculture (who is a Cabinet officer) has general charge of the affairs of the Department, 3 Assistant Secretaries aiding in their general supervision. This branch includes the Office of the Solicitor, which has charge of the law work of the Department, and the Office of Information, which through agricultural and other papers, and by means of pamphlets, circulars, and posters, places in the hands of farmers in simple and understandable form helpful information obtained by the Department's scientists, specialists, and field workers through their studies, investigations, and experiments.

2. **Weather Bureau.** The work of this Bureau which especially benefits agricultural interests, consists of forecasting the weather; displaying storm, cold-wave, frost, and flood warnings; furnishing information useful in connection with water for irrigation, relation of weather to crops, and effects of current weather conditions on important crops; determining the history of the climate of the various sections of the country; sending out special warnings for the growers of certain crops; and maintaining special stations in connection with the most important crops.

3. **Bureau of Animal Industry.** Conducts work with livestock and poultry and their food products, and is charged with the enforcement of the laws regarding the control of diseases of livestock (p. 101); proper treatment of livestock in interstate traffic (p. 107); meat inspection (p. 106); the handling of oleomargarine and process or renovated butter (p. 106); and the manufacture and distribution of viruses, serums, and toxins (p. 105). Besides the assistance rendered the farmer through the enforcement of the laws mentioned, the Bureau aids him by improving his livestock by scientific breeding; feeding livestock and poultry more economically and with better results; deciding the best sections of the country in which to carry on the different branches of the livestock industry and the animals best adapted to the various sections; improving and caring for dairy and poultry products; improving stock feeds, silos, and sanitary conditions in connection with livestock; organizing in the interest of better methods and increased production; and controlling pests and diseases of livestock and poultry.

4. **Bureau of Plant Industry.** Studies plant life in all its relations to agriculture, and is charged with the enforcement of the pure-seed law (p. 105). It aids the farmer by working out means for controlling diseases of his crops; determining the best crops and best varieties for different sections and conditions; producing and distributing free of charge improved and valuable varieties of seeds and plants, and strains resistant to diseases and insects and with increased resistance to drought; improving the fertility of the soil through improved methods of cultivation, cropping, rotation, and the use of fertilizers and of nitrogen-fixing bacteria, which it distributes free; examining and testing commercial seeds in order to prevent the use of impure seed; determining the best methods of growing crops in semiarid regions; developing profitable agriculture for lands in the West to be placed under irrigation and determining what crops can be profitably grown under irrigation; improving methods of growing, preparing, and shipping perishable fruits and vegetables; assisting in establishing agricultural industries on reclamation projects; and bringing in seeds and plants from all parts of the world, and establishing new plant industries in the United States.

5. **Forest Service.** Has charge of the national forests; studies forest conditions and methods of using the forests; investigates properties of woods and the processes used in the manufacture of forest products; and gathers information regarding the needs of wood-using industries and the relation of the forests to the public welfare.

It aids the farmer and the nation at large by (1) controlling forest fires, thoroughly organized forces and the necessary sets of equipment for dealing with these fires being maintained in the different national forests; (2) arranging with owners for the grazing of livestock on forest ranges; (3) determining methods of improving and protecting the ranges from overgrazing; (4) protecting stock against poisoning from certain plants, and destroying such plants on ranges; (5) determining best methods of handling stock under

FIG. 73. A Forest Service lookout in a heavily timbered region. The Government not only makes and enforces laws, but also helps the farmer to abide and profit by them.

range conditions and of developing and distributing stock watering places on the ranges; (6) reforesting national forest areas, the necessary nurseries for producing planting stock for this purpose being maintained; (7) determining the relation of forestry to climate and stream flow; (8) determining the best methods for range management, the reseeding of the range and prevention of erosion in mountain meadows; (9) improving practices in the handling of woodlots and marketing of woodlot products; (10) destroying in national forests animals which prey upon livestock; (11) classifying and setting apart lands in the national forests that may be opened for settlement and entry under the homestead laws; and (12) coöperating with state and local authorities in building and repairing roads, trails, and bridges in the national forests in order to open new territory to settlement and provide settlers with means of communication and transportation, this work being done under the Federal Road Act (p. 108).

6. **Bureau of Chemistry.** The work of this Bureau is mainly agricultural chemistry and the enforcement of the Food and Drugs Act (p. 106). It aids the farmer through investigations and experiments in the feeding of farm animals and plants; investigations and experiments to determine the best fungicides and insecticides; studies in the drying of fruits and vegetables; conservation of surplus fruit and vegetable products; and investigations to determine the causes of dust explosions in mills and factories.

7. **Bureau of Soils.** Studies the relation of soils to climate and organic life and the composition and texture of soils; makes soil surveys in different parts of the country; investigates fertilizer resources and new materials for use as fertilizers; and works out methods for improving the manufacture of fertilizers.

8. **Bureau of Entomology.** Studies beneficial and injurious insects, works out means of controlling injurious species, and tests spraying machinery. As a result, the farmer is saved vast amounts annually through the control of insect pests of plants and animals, his own health is safeguarded against diseases carried by the mosquito and the house fly, and practices in connection with the bee industry are improved.

9. **Bureau of Biological Survey.** Conducts work with wild birds and mammals, and is charged with the enforcement of the law to prevent the importation of birds and mammals injurious to the farmer (p. 101), the law for the protection of migratory birds (p. 105), and the Convention between Great Britain and the United States for the protection of migratory birds (p. 105). It aids the farmer by working out methods for protecting birds and mammals that are useful and for controlling those that are harmful to his crops and stock, and by coöperating with State and local authorities in destroying injurious mammals.

10. **Bureau of Markets.** Helps the farmer to dispose of his products to the best advantage by determining the demand and supply for various products at home and abroad; by working out improved methods of grading, standardizing, packing, and shipping; and by sending out daily reports of shipments and prices of certain fruits and vegetables during their respective market seasons. It also enforces the Grain Standards Act (p. 107), the United States Cotton Futures Act (p. 107), the Warehouse Act (p. 107), and the Standard Basket Act (p. 107).

11. **Bureau of Crop Estimates.** Collects and publishes information regarding the condition of the principal crops and probable yields and prices.

12. **States Relations Service.** Acts as a clearing house in establishing and maintaining proper relations between the Department and the agricultural colleges and experiment stations; conducts the experiment stations in Alaska, Hawaii, Porto Rico, and Guam; carries to the farmers in every section of the country the facts discovered and the improvements worked out by the Department, and teaches him through county and state agents how to use this information in improving his land and his crops and livestock, how to prevent or control diseases attacking plants and animals, how to increase the yields from his farm, and how to handle his farm products to the best advantage; works out improved methods in connection with the conduct of movable schools of agriculture and farmers' institutes and other farmers' organizations and furnishes these organizations with helpful reading and illustrated matter; aids agricultural schools in providing the best matter for fitting students to deal with agricultural problems; and is charged with the duties of the Department as created by the Morrill Act establishing agricultural colleges (p. 99), the Hatch Act establishing agricultural experiment stations (p. 100), and the Smith-Lever Act providing for agricultural extension work and home economics work in coöperation with the state agricultural colleges (p. 101).

13. **Office of Public Roads and Engineering.** Determines the best materials for use

in road building; aids state and county officials in the construction and upkeep of roads through advice, instruction, and supervision of the building of object-lesson roads and bridges; determines the best dust preventives for roads; builds rural post roads in coöperation with the states, and builds and keeps up roads and trails in national forests in coöperation with the states and the Forest Service; determines the best methods of disposing of sewage on the farm; works out improvements in the use of water for irrigation; gives farmers advice and assistance in connection with farm irrigation, farm drainage, construction of farm buildings and machinery, and other questions regarding farm engineering; and is charged with the enforcement of the Federal Road Act.

14. **Office of Farm Management.** Works out and introduces better business methods and improved farm practices among farmers.

15. **Division of Publications.** Through this branch the publications of the Department are distributed to farmers.

16. **Insecticide and Fungicide Board.** Aids the farmer by enforcing the Insecticides Act of 1910 (p. 102).

17. **Federal Horticultural Board.** Enforces the Plant Quarantine Act (p. 102), and thus saves the farmer vast sums annually by preventing, wiping out, or controlling diseases affecting his crops.

18. **Miscellaneous.** Efforts are being made to help the farmer to produce livestock on a commercial basis in the cane-growing and cotton districts, and to establish dairying and livestock production in the semiarid and irrigated sections of the country.

AN ACT to provide for stimulating agriculture and facilitating the distribution of agricultural products. This act, which is a war emergency measure, was approved August 10, 1917. Its objects are to enlarge the scope of certain lines of work of the Department of Agriculture, provide for a food survey, assist state agencies in supplying farm labor, and to secure seed stocks and furnish same to farmers for cash for use in the production of food crops in restricted areas.

Under this act it is the duty of the Secretary of Agriculture, with the approval of the President, to investigate and ascertain the demand for, the supply, consumption, costs, and prices of, and the basic facts relating to, ownership, production, transportation, manipulation, storage, and distribution of foods, food materials, feeds, seeds, fertilizers, agricultural implements, and machinery, and any other article required in connection with the production, distribution, or utilization of food. It is the duty of anyone called on by the Secretary for information in this connection to furnish same within 30 days; failure or refusal to do so is punishable by fine or imprisonment.

In case the Secretary finds that there is or may be special need in any restricted area for seeds for the production of food or feed crops, it is his duty to purchase or contract for the growing of such seeds, to store same and furnish them to the farmer for cash at cost, including the expense of packing and transportation.

Educational Legislation for the Farmer

After the establishment of the Department of Agriculture, the next step for the benefit of the farmer was logically an effort to provide him with an opportunity of securing an agricultural education. This was undertaken by the Federal Government through 2 acts, as follows:

THE MORRILL ACT. This was passed by Congress July 2, 1862, and is administered by the Secretary of the Interior through the Bureau of Education. Under it the Government donated to each state public lands at the rate of 30,000 acres for each of its Senators and for each Representative to which it is entitled according to the census of 1860, for the purpose of creating a perpetual fund for use in establishing and maintaining at least one agricultural and mechanical college, the leading object of which is to teach (without excluding other scientific and classical studies and including military tactics) "such branches of learning as are related to agriculture and the mechanic arts." Later legislation provided for further endowments of these colleges, until now each state receives an annual appropriation of $50,000 for the purpose.

Under this legislation 68 institutions are now receiving these Government endowments and maintaining courses in agriculture. There is one in each state and in Porto Rico and Hawaii, and 16 of the states have 1 additional, and one state 2 additional institutions for colored students.

So extensive and varied are the courses of these institutions that practically every phase of agriculture receives more or less attention, and every farmer's boy or girl who can afford to attend one of these colleges can acquire from it an agricultural education.

AN ACT to provide for vocational education. This was approved February 23, 1917, and is administered by a Federal Board of Vocational Education created by the act, and consisting of the Secretaries of Agriculture, Commerce, and Labor, the United States Commissioner of Education, and 3 citizens appointed by the President, by and with the consent of the Senate, to represent commerce and manufacturing, agriculture, and labor, respectively.

The act appropriates for the use of the states in paying salaries of teachers, supervisors, or directors of agricultural subjects, $500,000 for the fiscal year ending June 30, 1918, and gradually increases the amount each year for 7 years, after which it is $3,000,000 annually; it makes separate and distinct appropriations for the use of the states in paying the salaries of teachers of trade, home economics, and industrial subjects; and appropriates for coöperation with the states in preparing teachers, supervisors, and directors of agricultural subjects, and teachers of trade, industrial, and home economics subjects, $500,000 for the year ending June 30, 1918, $700,000 and $900,000 for the two succeeding years, and $1,000,000 for each year thereafter.

Before any state may receive the benefit of these appropriations, it must create or designate a Board of not less than 3 members to coöperate with the Federal Board and to prepare and submit to it for its approval, plans showing the kind of vocational education for which it proposes to use the appropriations, the kinds of schools and equipment, course of study, methods of instruction, qualifications of teachers and of supervisors or directors in the case of agricultural subjects, and plans for training teachers, and, in the case of agricultural subjects, plans for supervision of education.

The appropriations are allotted to the states on the basis of population, and, should the funds allotted to any state become diminished or lost, they must be replaced by that state.

Investigational Legislation Concerning Agriculture

The agricultural colleges taught the theories of the various sciences connected with agriculture, but they fell far short of accomplishing their objects and possibilities until supplemented in 1887 with facilities for carrying on original research and experimental work through what is known as

THE HATCH ACT. This act, approved March 2, 1887, provides for establishing, under the direction of the agricultural and mechanical college or colleges in each state, a department to be known as the agricultural experiment station, for the purpose of "acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science." The duties of these stations is "to conduct original researches or verify experiments on (1) the physiology of plants and animals; (2) the diseases to which they are severally subject, with the remedies for same; (3) the chemical composition of useful plants at the different stages of growth; (4) the comparative advantages of rotative cropping as pursued under the varying series of crops; (5) the capacity of new plants or trees for acclimation; (6) the analysis of soils and water; (7) the chemical composition of manures, natural or artificial, with experiments designed to test the comparative effects on crops of different kinds; (8) the adaptation and value of grasses and forage plants; (9) the composition and digestibility of the different kinds of feed for domestic animals; (10) the scientific and economic questions involved in the production of butter and cheese; (11) and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable."

Under the Hatch Act and later legislation, each state now receives annually $30,000. The stations receive funds from the states also, but the total amount contributed by the Federal Government is larger than the total amount contributed by the states.

Besides the experiment stations in the states, one each has been established in Alaska, Hawaii, Porto Rico, and Guam. These are conducted by the U. S. Department of Agriculture through the States Relations Service.

Extension Legislation for the Farmer

Notwithstanding the great activity of the agricultural colleges, it was found impossible to reach many adults and others who, for one reason or another, could not come to these colleges. Moreover, the experiment stations and the Federal Department of Agriculture were constantly accumulating a vast mass of agricultural information as a result of their investigations and experiments, and the necessity of getting this before the farmer in practical

form and of teaching him how to apply it on his farm became more and more pressing. The solution of these problems was brought about in 1914 by

THE SMITH-LEVER ACT. This act was approved May 4, 1914, and provides that agricultural extension work shall be carried on in coöperation with the Department of Agriculture by each of the state colleges of agriculture receiving the benefits of the Morrill Act and supplementary legislation, for the purpose of "diffusing among the people of the United States useful and practical information on subjects relating to agriculture and home economics, and to encourage the application of the same."

Under the act $480,000 is appropriated annually to meet the necessary expenses of the work; and there is further appropriated for the second fiscal year $600,000, and for each fiscal year thereafter for 7 years an additional $500,000 over the amount appropriated the preceding year, or at the end of the period $4,100,000 annually besides the first-mentioned item of $480,000.

The appropriations other than the $480,000 are allotted annually to each state in the proportion that the rural population of each bears to the total rural population of all the states, based on the next preceding Federal census, but no payment is made in any year from the additional appropriations until an equal sum has been appropriated for that year by the state legislature, or provided by state, county, college, local authority, or individual contributions from within the state for the purpose of the act. Furthermore, none of the appropriations for any year becomes available to any college until it submits its plans for the work to, and the same are approved by, the Secretary of Agriculture.

Regulatory Legislation Affecting the Farmer

As the agricultural interests of the country developed, the necessity of regulatory legislation along certain lines also developed, and as a result we have what is by far the largest class of laws affecting rural interests. The facts that no policemen or uniformed guardians of the law, as they are known in cities, are stationed on the farm, and that the provisions of this class of legislation are enforced for the most part at places other than the farm, are significant evidence that these laws are intended, in most cases, primarily for the benefit of the farmer. This class of laws may be divided into 2 groups: (1) those which affect the farmer directly and pertain mainly to material going to, or property on the farm; and (2) those which affect the farmer indirectly and pertain mainly to farm products after they have left his hands. It is, of course, impossible to discuss or even list the great number of state and local laws that fall within this class; but the following more important and widely applicable Federal statutes illustrate their general nature:

Laws Directly Affecting The Farmer

AN ACT for the control of diseases of livestock. This act, approved May 29, 1884, and supplemental acts approved February 2, 1903, and March 3, 1905, are designed to stamp out, and to prevent the introduction and spread of contagious, infectious, and communicable diseases. No animal affected with such disease may be exported, placed in interstate traffic, or driven or taken to or from any state or territory or the District of Columbia. The Secretary of Agriculture is authorized to make rules and regulations for carrying out the provisions of the law, to establish quarantines, and to take such steps as may be necessary to accomplish the purpose of the act. In connection with it the Bureau of Animal Industry maintains a large number of inspection stations throughout the country.

The Lacey Act, approved May 25, 1900, prohibits the importation into the United States or any territory or District thereof, of the mongoose, "flying fox," or fruit bat, the English sparrow, starling, and such other mammals and birds as may from time to time be declared injurious to the interests of agriculture or horticulture; and provides that whenever any of these arrive at a port of entry, they must be destroyed or returned at the owner's expense. Except in the case of natural history specimens for museums or scientific collections, cage birds, and such other birds as the Secretary of Agriculture may designate, no foreign wild mammal or bird may be imported except under special permit from the Secretary of Agriculture.

Under this act it is also unlawful for any one to deliver to any common carrier for transportation and for any common carrier to transport from any part of the United States to any other part thereof any foreign mammal or bird the importation of which is prohibited; or so to handle dead bodies or

FIG. 74. Forest rangers inspecting cattle that are being turned onto the pastures of a National forest. Precautions and preparation are a large factor in successful lawmaking and the preservation of law and order. (U. S. Forest Service.)

parts of wild mammals or birds killed or shipped in violation of the laws of the state or territory in which they were killed or from which they were shipped.

INSECTICIDES ACT OF 1910. This act has as its object the prevention of the manufacture and sale of insecticides and fungicides that are adulterated or misbranded.

Samples for examination are collected, in accordance with uniform rules, by regularly appointed official sample collectors acting under the supervision of the Insecticide and Fungicide Board, and are examined in the Department of Agriculture by branches designated by the Secretary of Agriculture.

Should it appear on examination of any specimen that the article is adulterated or misbranded within the meaning of the law, the Secretary of Agriculture is required to notify the party from whom the sample was obtained and give him opportunity to be heard. If after the hearing it still appears that the act has been violated, the Secretary is required to submit the facts at once, together with a sworn copy of the results of the analysis, to the proper United States Attorney, who is required to commence proceedings in the proper United States court for the enforcement of the penalties.

Goods alleged to be in violation of the law may be seized by process of libel, and if the judgment of the court condemns them as being adulterated or misbranded, they may be destroyed or sold, as the court may direct, the proceeds in case of sale, less legal costs and charges, to be paid into the treasury of the United States; or the goods may be delivered to the owner in case he furnishes an acceptable bond to the effect that they will not be sold or disposed of contrary to the act or the laws of any state, territory, or the District of Columbia.

The Secretary of the Treasury is required to furnish the Secretary of Agriculture, on the latter's request, samples of articles covered by the act which are being imported or offered for import into the United States. If examination shows that any such article is in violation of the law, it is refused admission, and is destroyed by order of the Secretary of the Treasury unless exported by the consignee within 3 months.

THE PLANT QUARANTINE ACT. The purposes of this act, approved August 20, 1912, are to regulate the importation of nursery stock and other plant products; to provide for establishing quarantines and quarantine districts for plant diseases and insect pests; to permit and regulate the movement of fruits, plants, and vegetables therefrom," etc.

Under this act it is unlawful to import nursery stock, that is, "field-grown florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees or shrubs, and other plants and plant products for propagation, except field, vegetable, and flower seeds, bedding plants, and other herbaceous plants, bulbs, and roots," or to offer it for entry into the United States unless a permit therefor has been issued by the Secretary of Agriculture. In case the stock is imported from a country in which a system of plant inspection is maintained, it must also be accompanied by a certificate of inspection from the proper official of that country showing that it has been thoroughly inspected and is believed to be free from injurious diseases and insect pests. If imported from a country in which no system of plant inspection is maintained, it may be brought in under such conditions and regulations as the Secretary of Agriculture may prescribe.

Should the Secretary of Agriculture determine that the unrestricted importation of any plants, fruits, vegetables roots, bulbs, seeds, or other plant products not included under the term "nursery stock" may result in the introduction of injurious disease or insect pests, it is his duty to publish his decision, specifying the class of plants or plant products involved and the country and locality in which grown, after a public hearing has been given at which any interested party may be heard. As soon as the Secretary's determination is published and until it is withdrawn, the importation of the designated plants or plant products is prohibited.

The Secretary of Agriculture is authorized and directed to quarantine any state, territory, or district of the United States or any part thereof when in his judgment such quarantine is necessary to prevent the spread of dangerous plant disease or insect pest not hitherto widely prevalent or distributed throughout the United States; but before doing this he must give a public hearing, at which any person interested may appear.

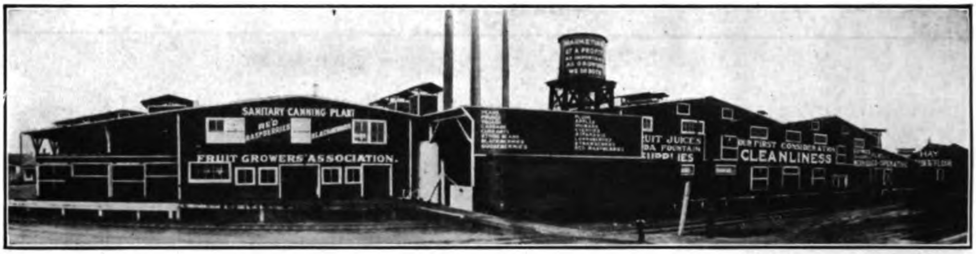
After giving out notice of such quarantining of any area, no plant or plant material specified in the notice may be shipped or offered for shipment to any common carrier, or received or transported by such carrier except in accordance with such rules and regulations permitting and governing the inspection, disinfection, certification, and man-

The public sale is a popular and profitable method of advertising a purebred livestock business

The farmer should be alive to every legitimate means of making himself and his products known and their quality appreciated

Direct retail marketing opens a way to much valuable publicity

THE SUCCESSFUL FARMER MUST BE A GOOD ADVERTISER, WITH SOMETHING GOOD TO ADVERTISE



A coöperative canning plant developed by a marketing association to handle its surplus fruit and other produce. (U. S. Bureau of Markets)

A rural coöperative fruit and vegetable market in which "no commissions" is the rule. (American Coöperative Journal)

A farmers' coöperative store that did a business of $16,000 the first six months, paying a capital stock dividend of 6 per cent, and a purchase dividend of 10 per cent. (American Coöperative Journal)

COÖPERATIVE MARKETING TAKES VARIOUS FORMS BUT ALMOST INVARIABLY IT PAYS

ner and method of delivery and shipment as the Secretary of Agriculture may issue.

THE SEED IMPORTATION ACT. This act, approved August 24, 1912, together with supplementary legislation, prohibits the importation of seed of alfalfa, barley, Canadian bluegrass, Kentucky bluegrass, awnless brome grass, buckwheat, clover, field corn, Kafir corn, meadow fescue, flax, millet, oats, orchard grass, rape, redtop, rye grass, rye, sorghum, timothy, wheat, vetches, and mixtures of seeds containing any of these seeds as one of the principal parts, when adulterated or unfit for seeding purposes. The seeds and mixtures mentioned may, however, be delivered to the owner or consignee in bond to be recleaned in accordance with and subject to such regulations as the Secretary of the Treasury may prescribe. When cleaned to conform to the standard of purity specified below, as determined by the examination of samples by the Department of Agriculture, and when the screenings and other refuse are disposed of as required by the Secretary of Agriculture, the seed or mixture may be released to the owner or consignee.

Under the law, red clover seed is considered adulterated when it contains more than 3 per cent by weight of seed of yellow trefoil or any other seed of similar appearance to and of lower market value than red clover; alfalfa seed, when it contains more than 3 per cent by weight of seed of trefoil, bur clover, and sweet clover singly or combined; and any other kind, variety, or mixture (except mixtures of white and alsike clover, red and alsike clover, or alsike clover and timothy) when they contain more than 5 per cent by weight of seed of another kind or variety of lower market value and similar appearance.

Seed is considered unfit for seeding purposes when any kind, variety, or mixture of the seeds named contains less than 65 per cent of live pure seed as distinguished from dead seed, chaff, dirt, or other seeds or foreign matter, *except* that of Kentucky bluegrass and Canada bluegrass seed, which may contain not less than 50 per cent of live pure seed.

The provisions of this act do *not* apply to the importation of barley, buckwheat, field corn, Kafir corn, sorghum, flax, oats, rye, or wheat not intended for seeding purposes when shipped in bond through the United States or imported for the purpose of manufacture.

THE VIRUS - SERUM - TOXIN ACT. This act was approved March 4, 1913, its object being to protect the farmer against worthless, harmful, contaminated, or dangerous viruses, serums, toxins, and other substances intended for use in the treatment of domestic animals, by prohibiting the manufacture, importation, and sale of, or traffic in, these articles unless they conform to rules and regulations made by the Secretary of Agriculture. Each manufacturer of such articles must obtain a license from the Secretary of Agriculture, and have his plant inspected by the Bureau of Animal Industry to see that the output conforms to the requirements. This Bureau also examines samples of all viruses, serums, and toxins imported or to be imported, unless they conform to the requirements they are refused entry.

MIGRATORY BIRD LAW. This law, approved March 4, 1913, places all migratory game and insectivorous (insect-eating) birds which do not remain permanently within the borders of any state or territory, in the custody and under the protection of the Government.

As defined by the regulations of the Department under the law, migratory insectivorous birds are the bobolink, catbird, chickadee, cuckoo, flicker, flycatcher, grosbeak, hummingbird, kinglet, martin, meadowlark, nighthawk or bull bat, nuthatch, oriole, robin, shrike, swallow, swift, tanager, titmouse, thrush, vireos, warbler, waxwing, whippoorwill, woodpecker, and wren, and all other perching birds which feed entirely or chiefly on insects.

The closed season extends throughout the entire year for all insectivorous birds except reedbirds or rice birds, the closed season for these in New Jersey, Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, and Georgia extending from November 1 to August 31, inclusive. However, any insectivorous bird may be collected under permit at any time for scientific purposes in accordance with the laws of the state in which collected.

For the protection of migratory game and insectivorous birds, the regulations provide a breeding zone and a winter zone. The former comprises 30 states, namely: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Kentucky, West Virginia, Michigan, Wisconsin, Minnesota, Iowa, North Dakota, South Dakota, Nebraska, Kansas, Missouri, Colorado, Wyoming, Montana, Idaho, Utah, Nevada, Oregon, and Washington. The latter, or winter, zone, includes the District of Columbia, and the following 17 states: Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, Arkansas, Louisiana, Texas, Oklahoma, New Mexico, Arizona, and California.

CONVENTION between Great Britain and the United States for the protection of migratory birds. This was entered into, ratified, and proclaimed by the President in 1916. The provisions of the Convention, so far as the United States is concerned, are administered by the Secretary of Agriculture through the Bureau of Biological Survey. Included under the terms of the Convention are migratory game birds, migratory insectivorous birds, and other migratory nongame birds, many species of which traverse certain parts of Canada and the United States. The provisions of the Convention are of direct interest

to the farmer in so far as they relate to insectivorous birds, which are the same as designated in the Migratory Bird Law.

Under the provisions of the Convention the closed season on migratory insectivorous birds continues throughout the year, and the taking of the nests or eggs of these birds except for scientific or propagating purposes is prohibited in accordance with such laws or regulations as the High Contracting Powers may severally deem necessary.

International traffic in insectivorous birds or their eggs and their shipment or export are prohibited, except for scientific purposes; such shipments between the United States and Canada must be marked plainly with the name and address of the shipper and the contents.

Should any insectivorous bird become seriously injurious to agricultural or other interests in any particular community, the proper authorities of the High Contracting Powers may issue permits to kill such birds under certain regulations, but such permits lapse or may be canceled at any time when, in the opinion of the authorities, the emergency has passed. Birds killed under such permits may not be shipped, sold, or offered for sale.

The terms of the Convention are to continue in force for 15 years after date of ratification, and, unless 12 months' notice of intention to terminate its operations is given by either of the High Contracting Powers before the expiration of the 15 years, the Convention will continue one additional year, and so on from year to year thereafter.

AN ACT for the conservation, control, and distribution of food products and fuel. This war emergency measure, approved August 10, 1917, and administered by the President of the United States through such agencies as he may designate, includes 2 sections which directly affect the farmer. The first of these authorizes the President, whenever during the war emergency it becomes necessary to stimulate the production of wheat, to fix for each of the official standards for wheat a guaranteed price that will insure the producer a reasonable profit, and to publish these prices as far in advance of seeding time as possible.

The act guarantees prices for the several standard grades for the crop of 1918 on the basis of No. 1 northern spring wheat or its equivalent at not less than $2 per bushel at the primary markets, this guarantee being binding until May 1, 1919. Should the importation of wheat grown outside the United States materially increase the liabilities of the United States under guarantees made by the act, the President is required to add to the existing rate of duty such additional duty as is necessary to bring the price at which the wheat is imported up to the price fixed under the provisions of the section.

To make any price guaranteed under this section effective and to protect the Government against material increase of its liabilities as the result of any guarantee, the President may purchase any wheat for which a guaranteed price has been fixed, and hold, dispose of, or use same as Government supplies, the proceeds in case of sale to be used as a fund for further carrying out the purposes of this section of the act, or, if not needed, to be turned into the Treasury.

The second section of the act which is of direct interest to the farmer authorizes the President to procure or aid in procuring such available stocks of nitrate of soda as he may determine to be necessary for increasing agricultural production during the calendar years 1917 and 1918, and sell same for cash at cost, including expenses, the proceeds to be turned into the Treasury.

Laws Indirectly Affecting the Farmer

OLEOMARGARINE ACT. This act was approved August 27, 1886, and amended in 1890 and 1902. Its object is to protect the public from imposition through the manufacture and sale of oleomargarine and process or renovated butter. It makes oleomargarine and any other imitation dairy product shipped into any state, territory, or the District of Columbia subject to its laws; fixes the taxes to be paid by manufacturers and importers of, and wholesale and retail dealers in, oleomargarine or process or renovated butter, and the taxes on oleomargarine artificially colored in imitation of butter; and fixes the requirements regarding the size and kind of containers and stamping and labeling.

THE FOOD AND DRUGS ACT. This act, approved June 30, 1906, aims to protect the health of, and prevents imposition on, the public by prohibiting the manufacture and sale of adulterated or misbranded or poisonous or deleterious foods, drugs, medicines, and liquors, and interstate commerce in them. Whenever a farmer ships his products direct from the farm into or through another state, or sells them within the District of Columbia, he is subject to the provisions of the act.

MEAT INSPECTION ACT. This act, approved June 30, 1906, aims to protect the health of, and prevents imposition on, the public, including the farmer, by prohibiting the use in interstate and foreign commerce of meat and meat food products which are unsound, unhealthful, unwholesome, or otherwise unfit for human food.

AN ACT to prevent cruelty to animals in interstate traffic. This act, the object of which is explained by the title, was approved in 1906, and supplemented by another approved in 1913. Every animal in interstate traffic confined in any common carrier in which there is not proper food, water, space, and opportunity for rest, must be humanely unloaded into proper pens at intervals of not to exceed 24 hours, unless this is impossible,

or 36 hours under certain conditions, and fed, watered, and rested during a period of 5 consecutive hours. In the case of sheep, it is not required that they be unloaded at night to keep within the 24-hour time limit, but they must be unloaded within 36 hours.

AN ACT to establish a standard barrel and standard grades for apples packed in barrels. This act, approved August 3, 1912, is administered by the Bureau of Standards. The dimensions of the standard barrel as provided by it are: Length of stave 28½ inches, diameter of head 17½ inches, distance between heads 26 inches, circumference of bulge 64 inches, outside measurement; these represent as nearly as possible 7,056 cubic inches. In the case of steel barrels the interior dimensions are to be as given. The act also fixes the standard grades for apples packed in barrels for interstate or foreign commerce and sets forth requirements regarding branding.

AN ACT to fix the standard barrel for fruits, vegetables, and other dry commodities. This act was approved March 4, 1915, and rules and regulations permitting reasonable variations thereunder are made by the Director of the Bureau of Standards and approved by the Secretary of Commerce. The dimensions of the standard barrel provided by this act are the same as those given in the preceding paragraph and the thickness of staves must not be greater than four tenths of an inch, but any barrel of a different form which has a capacity of 7,056 cubic inches is also standard.

Every barrel containing fruits or vegetables or any other dry commodity used for interstate or foreign commerce, and every subdivision thereof, known as a third, half, or three-quarters barrel, must conform to the standard or come within the variations permitted by the regulations. Barrels shipped to foreign countries may be constructed according to the directions of the foreign customer, provided they conform to the laws of the country to which they are to be shipped.

THE UNITED STATES COTTON FUTURES ACT was approved in 1914, and reenacted in 1916. Its object is to tax the privilege of dealing on exchanges, boards of trade, and similar places in contracts of sale of cotton for future delivery. It provides that the Secretary of Agriculture shall establish and publish official standards of cotton, and that an excess of 2 cents per pound shall be levied on all cotton involved in any contract of sale for future delivery, unless the contract conforms to certain requirements, most of which involve the question of grades.

WAREHOUSE ACT. This was approved in 1916, its object being to afford proper storage, warehousing, classification according to grades and otherwise, weighing and certification of agricultural products, namely, cotton, wool, grains, tobacco, and flaxseed, which it is desired to store for interstate or foreign commerce. The Secretary of Agriculture issues licenses to warehousemen or others under conditions required by the act, and exacts bonds for the faithful performance of obligations under the laws of the state, territory, or district in which the warehouse is conducted and as required by the act, and such obligations as are assumed in the contract with the depositor of agricultural products in the warehouse.

AN ACT to fix standards for Climax baskets for grapes and other fruits and vegetables, and for baskets and other containers for small fruits, berries, and vegetables. This act, approved in 1916, fixes the sizes and dimensions in inches of Climax baskets thus:

	2 qt.	4 qt.	12 qt.
Length of bottom piece....	9½	12	16
Width " " "	3½	4½	6½
Thickness of bottom piece..	⅜	⅜	7/16
Height (outside)..........	3⅞	4 11/16	7 1/16
Top and cover: length........	11	14	19
Top and cover: width........	5	6¼	9

The sizes of standard baskets or other containers for small fruits, berries, and vegetables are the dry half pint, pint, and quart or a multiple of one of these, containing, respectively, 16 8/10, 33 6/10 inches, and 67 2/10 cubic inches.

Every basket or container as specified in the act which is manufactured or sold for shipment within the United States must conform to the standards; and in the case of baskets or containers intended for export, each must conform to the specifications of the foreign purchaser or with the laws of the country to which it is to be shipped.

AN ACT to standardize lime barrels. This act, approved in 1916, and administered by the Secretary of Commerce through the Bureau of Standards, establishes a large and small barrel of lime, the former consisting of 280 pounds and the latter of 180 pounds net weight. All barrels of lime imported or entering into interstate commerce must conform to these standards, or, if the containers are of less capacity than the small barrel, they must be sold as fractional parts of such barrel.

THE GRAIN STANDARDS ACT. Under this act, approved August 11, 1917, the Secretary is authorized to investigate the handling, grading, and transportation of grain, and to fix standards of quantity and condition for corn, wheat, rye, oats, barley, flaxseed, and such other grains as, in his judgment, may be permitted and warranted by the usages of the trade, these standards to be known as the official grain standards of the United States. The Secretary appoints grain inspectors, and the grains for which standards are fixed and which are to be entered in interstate or foreign commerce must conform to the grades claimed.

Laws Relating to Rural Construction

Probably no single factor connected with agricultural progress is more important than good roads. If through bad roads the farmer is handicapped in taking his produce to market and bringing supplies to his farm, much time and energy that would otherwise be devoted to the improvement of his property is wasted in contending with adverse conditions that are not remedied by his efforts. The public road or highway is of interest not only to the people living in the territory through which it passes, but also to the traveling public; nor is it limited by township, county, or state boundaries. In other words the question of good roads is largely a national question, and this fact was recognized by the Federal Government in

THE FEDERAL ROAD ACT. This act was approved in 1916, its object being to aid the states in building toll-free rural post roads and in building and maintaining roads and trails in or near national forests when these are necessary for the development of resources on which those living in or near these forests depend. For the roads first mentioned the act provides a total of $75,000,000 for use between 1917 and 1921, a certain sum being made available each year; and for the roads and trails in or near national forests a total of $10,000,000 for use from 1917 to 1926 inclusive, $1,000,000 being made available each year. The Secretary of Agriculture apportions the appropriation for post roads among the states on the bases of area, population, and mileage of rural delivery and star routes.

Whenever any state wishes to avail itself of the benefit of the act, its highway department must prepare plans for the road proposed and these must be approved by the Secretary of Agriculture before construction begins. The road must be built under the supervision of the highway department and must be maintained by the state or by a civil division of it, as its laws provide.

Financial Legislation for the Farmer

Compared with other classes, the farmer was, until very recently, at a distinct disadvantage with respect to his ability to borrow funds with which to finance his operations. This was due to the fact that farm lands were not regarded by the financial world as bankable assets; and since such lands, with the attendant equipment, usually constituted the farmer's possessions, he had no collateral security to offer when it became necessary to borrow money. The necessity of remedying this situation and of placing the farmer on a just financial basis became more and more apparent as time passed, and gradually the attention of Congress and of many able financiers and others turned toward devising ways and means for accomplishing the desired objects. As a result of the efforts made—which included investigations by a special commission that visited Europe to study the subject in countries in which rural credit systems were in operation—we have the

FEDERAL FARM LOAN ACT. This act was approved July 17, 1916, and is administered by the Treasury Department through a Federal Farm Loan Board. This Board was created by the act, and consists of the Secretary of the Treasury and 4 citizens of the United States, not more than 2 of whom may be of the same political party, who are appointed by the President. One of these appointive members, designated by the President as Farm Loan Commissioner, is the active executive officer of the Board.

The work of the Board. It is the duty of the Board to divide continental United States (exclusive of Alaska) into 12 Federal Bank Districts; to establish a Federal land bank in each district and designate the city in which its principal office shall be located; to appoint a farm-loan registrar, one or more land bank appraisers, and as many land-bank examiners as may be deemed necessary for each; from time to time to require examinations and reports of conditions of all land banks and publish consolidated statements of results; to have appraisals made of farm lands as provided for in the act; to prepare and publish amortization tables; and to publish and distribute bulletins setting forth the principal features of the act and circulars instructing farmers regarding methods and principles of coöperative credit and organization in connection with it.

Federal Land Banks. Each Federal Land Bank is temporarily managed by 5 directors appointed by the Board, who choose from their number a president, vice president, secretary, and treasurer, and employ necessary assistants. It is the duty of the directors to make an organization certificate, which must show name of the bank, the district in which it is to operate, the city in which the principal office is to be located, the amount of capital stock and number of shares into which this is divided, and the fact that the certificate is made to enable the farmers to avail themselves of the advantages of the act. When this certificate is duly acknowledged, authenticated, and transmitted to the Farm Loan Commissioner, the bank becomes a corporate body with powers as defined by the act.

The stock of each bank is divided into shares of $5 each, and may be held by any individual, combination of individuals, or the Government. It is the duty of the Government to subscribe the balance of the stock of any of such bank which remains unsubscribed 30 days after its subscription books have been opened. Before beginning business a Federal land bank must have a subscribed capital stock of not less than $750,000.

On request of the Federal Farm Loan Board the Secretary of the Treasury may deposit unappropriated funds of the Treasury in any Federal Land Bank for its temporary use, but the amount so deposited may not exceed $6,000,000 at any one time. Permanent officers and directors are chosen after not less than $100,000 of the bank's stock has been subscribed by what is known as

National Farm Loan Associations. Whenever 10 or more persons who are owners, or about to become owners, of farm land qualified as security for a mortgage loan, desire to borrow money on farm-mortgage security, they may organize one of these associations. Their articles of association must specify the object of the association and the territory in which it is to operate, must provide for an increase of capital stock, and must be signed by the persons uniting to form the association.

The articles of association forwarded to the Federal land bank of the district must be accompanied by a written report of the loan committee provided for in the act, and an affidavit signed by the secretary-treasurer stating (1) that each of the subscribers is the owner, or about to become the owner, of farm land qualified as the basis of a mortgage loan, (2) that the loan desired by each is not more than $10,000 nor less than $100 and the aggregate not less than $20,000, (3) that the affidavit is accompanied by a subscription to stock of the Federal Land Bank equal to 5 per cent of the aggregate sum desired on mortgage loans, and (4) that a temporary organization has been formed as required by the act. On receipt of this the directors of the Federal land bank send an appraiser to investigate the character and solvency of the applicants and the value of their lands, determine whether a charter should be granted, and forward the articles of association, with his recommendations, to the Federal Farm Loan Board. If the recommendations are favorable, this Board grants the charter and designates the territory in which the association may make loans.

Whenever an association desires to secure a loan on first mortgage for any of its members, it subscribes for the capital stock of the Federal land bank of its district to the amount of 5 per cent of such loan. This subscription is paid in cash when the loan is granted and the capital stock is held by the Federal land bank as collateral security for the payment of the loan. The par value of each share in a farm loan association is $5, and the shareholders are entitled to one vote on each share, up to 20, at all elections of directors and at meetings of the shareholders.

After the farm loan associations have subscribed for not less than $100,000 of the capital stock of the Federal land bank of their district, the permanent officers and board of directors of the bank are chosen. The board consists of 6 local directors, who are elected by the National Farm Loan Associations, and 3 district directors, who are appointed by the Federal Farm Loan Board. All directors must have resided in their respective districts not less than 2 years, and at least one of the district directors must be an experienced farmer and engaged in actual farming in his district at the time of appointment.

Association membership. After a charter has been granted to a farm loan association, any person who is an owner, or about to become an owner, of qualified farm land and who desires to borrow on a mortgage on such land may become a member of the association upon a two-thirds vote of the directors, and by subscribing for the capital stock of the association at the rate of one share for each $100 of the face value of the loan desired, his subscription to be paid in cash when the loan is granted. This capital stock is held by the association as collateral security for the payment of the loan, the borrower is paid any dividends accruing and payable on the stock while it is outstanding, and the stock is retired on full payment of the loan.

Every shareholder in a farm loan association is individually responsible for all obligations of the association to the amount of his stock at par, in addition to the amount paid in and represented by his shares.

How to borrow money. Whenever a member of a farm loan association applies for a mortgage loan its loan committee examines the land offered as security, and makes a written report of its appraisal, etc. If unanimously favorable, this report and the application are referred to the Federal land bank and examined by its directors, and

then referred to one or more of the land bank appraisers, who also investigate the land; if their report is favorable the loan is made.

Each farm loan association has power to indorse, and thereby become liable for the payment of, mortgages taken from its shareholders by the Federal land bank of its district; to acquire and dispose of such real or personal property as may be necessary or convenient in its business; and to issue certificates against deposits of current funds bearing interest for not over 1 year at not to exceed 4 per cent per annum after 6 days from date, convertible into farm loan bonds when presented at the Federal Land Bank in the amount of $25 or any multiple thereof. Such deposits when received are transmitted to the land bank and invested by it in farm loan bonds issued by a Federal land bank or in first mortgages.

Whenever a farm loan association is voluntarily liquidated, a sum equal to its reserve becomes the property of the Federal land bank in which it is a shareholder.

What money may be borrowed for. All loans by Federal land banks are restricted to first mortgages on farm lands within the district of the respective Federal land bank, and loans may be made only for the purchase of lands for agricultural purposes, for necessary equipment, fertilizers, and livestock; to provide buildings; for the improvement of farm lands; and to cover indebtedness existing at the time of the organization of the first national farm loan association established in or for the county in which the mortgaged land is located; or indebtedness incurred for the purposes mentioned.

Joint stock banks. Not less than 10 persons may also form what is known as a joint stock land bank for lending on farm mortgage securities and issuing farm loan bonds, the organization to be subject to the requirements, and under the conditions, so far as applicable, prescribed for Federal land banks. The board of directors of each of these banks is composed of not less than 5 members, and as in the case of the farm loan associations, each shareholder is responsible for the bank's obligations to the extent of the amount of his stock at par value, as well as the amount paid in and represented by his stock, and each has the same voting privilege as the holder of shares in a national banking association. The Government may not purchase or subscribe for the capital stock of these banks.

A joint land bank may lend money on first mortgages on farm lands within the state in which its principal office is located or in a contiguous state, its loans being subject to all other restrictions on Federal land bank loans. Each joint stock bank has authority to issue bonds based on mortgages taken by it, and the rate of interest which it may charge on farm loans may not exceed by more than 1 per cent the rate established for the last series of farm loan bonds which it issued.

Farm loan bonds are issued by the Federal Farm Loan Board to any Federal land bank or joint stock land bank which has voted to issue farm loan bonds when such bank makes written application through the farm loan registrar of the district, accompanied by satisfactory collateral security consisting of first mortgages on qualified farm lands or U. S. Government bonds aggregating not less than the amount of the bonds to be issued, and such information as the Board requires.

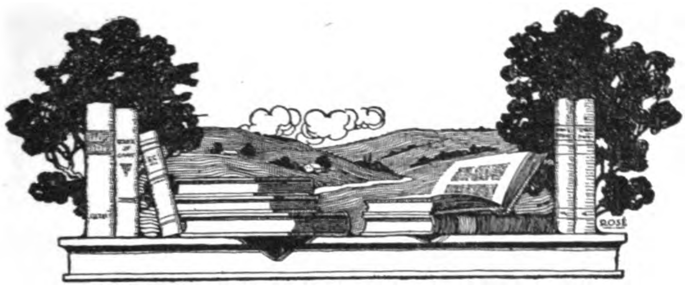
These farm loan bonds are issued in denominations of $25, $50, $100, $500, and $1,000, and are in series of not less than $50,000, the amount and terms being fixed by the Federal Farm Loan Board. They run for specified periods, are subject to payment and retirement at the option of the land bank any time after 5 years, bear interest not exceeding 5 per cent per annum from date of issue, and interest coupons payable semiannually.

Every Federal farm land bank issuing farm loan bonds is primarily liable for them and for interest payments due upon any farm loan bonds issued by other Federal land banks remaining unpaid in consequence of the default of such banks, and also for such portion of the principal of farm loan bonds as have not been paid after the assets of any such other land bank have been liquidated and distributed; but such losses must be assessed by the Federal Farm Loan Board against liable solvent banks in proportion to the amount of their outstanding farm loan bonds.

Reserves and dividends. Each Federal land bank and joint stock land bank must carry 25 per cent, and each farm loan association 10 per cent, of its net earnings semiannually to its reserve account until same shows a balance equal to 20 per cent of its outstanding capital stock; thereafter each Federal land bank and joint stock land bank must carry 5 per cent, and each farm loan association 2 per cent, annually to its reserve. After deducting this a dividend of the whole or any part of the balance of the net earnings may be declared.

Taxation. Every Federal land bank and national farm loan association, including capital and reserve or surplus and income derived from same, is exempt from Federal, state, municipal, and local taxes, except real estate taxes and mortgages executed to such banks and associations and to joint stock land banks; and farm loan bonds with the income derived from them are also exempt from taxes.

The act lists certain improper practices and provides penalties for them.



CHAPTER 8

Rural Economics

By THOMAS NIXON CARVER, *Professor of Economics in Harvard University, who has made a special study of this broad, complex, and difficult but highly important subject, both as a student and as a dweller and worker in the open country. In addition to teaching it at Oberlin College between 1894 and 1900, and at Harvard since 1900, he was Director of the Rural Organization Service of the U. S. Department of Agriculture in 1913-1914, and special adviser in agricultural economics to the Department in 1914-1916. He was born on an Iowa farm; filed a homestead claim in California, and ran a dairy while attending the University of Southern California; and has traveled and studied rural conditions in Germany, France, Italy, Switzerland, Belgium and Holland in addition to many sections of this country. Because of their unfamiliarity with this abstract subject, many persons prefer to "side-step" it, to close their eyes to its existence, rather than to make an effort to understand its principles and applications. In the past such an attitude was perhaps a safe one. In modern times the importance of farming as a business in its relation to national affairs, and the importance of the farm population in its relation to national life make some knowledge of economics an essential part of a well-rounded education. It is, moreover, part of the working equipment of the successful up-to-date farmer; for, after all, rural economics is simply another name for "Big Business in the Farm Community"—and what is closer than that to the farmer's interests?*—EDITOR.

RURAL economics may, perhaps, be best described as the science that investigates the conditions and laws affecting production, distribution, and consumption in the agricultural industry. It deals with such questions as the relation of agriculture to the life and labor of the nation as a whole, the systems of agriculture which contribute most to the prosperity of the whole agricultural class (including those who contribute only their labor as well as those who contribute their land), the systems of land tenure which give greatest stability and prosperity to the rural population, the systems of farm finance which promote the flow of capital into the most productive channels, the methods of marketing agricultural produce, and the best methods of organizing rural communities for the improvement of general social and living conditions in the open country.

The prosperity of agriculture is, as we are coming to see, greatly influenced by its contact with other lines of business and the lives of the nonagricultural classes, as well as by the policies of the Federal, state, and local governments. The rural economist should make a careful and comprehensive study of all these topics, and possess himself of some expert knowledge regarding some or all of them.

There was a stage in agricultural development when each farm was almost

sufficient unto itself, practically everything grown on the farm being consumed by the farmer's own household, and practically everything consumed being grown on the farm. The farmer was neither a buyer nor a seller on a large scale. The welfare of the household depended almost exclusively on the quality of the land and the internal efficiency of the farm organization. We have passed beyond that stage, and it is safe to say that the prosperity of the average farmer of to-day depends quite as much upon his contact with the outside world, upon the way in which his labor and enterprise fit into that of the nation as a whole, as it does upon the skill or industry with which the farmer himself grows his crops and feeds his livestock. He has become a buyer of raw materials and a seller of finished products, and is, therefore, in a very real sense a manufacturer, though he still works mainly out of doors rather than indoors. He is a capitalist and a user of capital, but he can scarcely expect to succeed in a large way without a knowledge of the nature of capital and its possibilities. More farmers fail because they are poor buyers and sellers, poor investors, and poor financiers than because they are poor producers.

Economic Characteristics of Agriculture

There are two outstanding facts which give character to agriculture and which distinguish it fundamentally from all other industries. The first is its greater dependence upon space; the other is its seasonal character. By its greater dependence upon space, is meant that, in proportion to the value of the product, more space is required in agriculture than in either manufacturing or mining. Forestry and fish culture, also, require wide spaces, but it is a question if they be not forms of agriculture. Certainly they are rural, rather than urban, in their character. By the seasonal character of agriculture is meant the fact that agricultural work changes with the seasons of the year and even with the hours of the day, so that no one is compelled to work at one and the same task year in and year out.

Agriculture is dependent upon wide spaces. Because of its demands upon space, agriculture must continue to be an outdoor industry. There is no reason why crops should not be grown indoors under glass except that so much space is required as to make the cost of housing prohibitive. In a few cases, indeed, where crops of high commercial value can be grown in small space, they are grown economically indoors, but such crops furnish a negligible fraction of the world's supply of food and clothing. Agricultural enterprise is, therefore, and, so far as we can see, must continue to be, "rural," that is, pertaining to the fields and open spaces.

So fundamental is ample space to agricultural development that it has given character to the historical development of rural people. The increase of numbers among the people of rural districts has always necessitated an extension of their agricultural area. Accordingly, rural migrations have always been in search of more space and wider fields as well as newer soil. We must distinguish, however, a strictly rural migration from a movement from country to city. By a rural migration is meant a migration of rural people who expect to continue in rural work. The movement of such people, in the absence of geologic or climatic changes, has always been away from densely populated toward sparsely inhabited regions.

Before the rise of the present commercial and manufacturing era, international wars were generally concerned, either directly or indirectly, with problems of territorial expansion. In an agricultural age a great nation can be built only on wide territories. Manufacturing and commerce, however, depend primarily upon markets and only secondarily upon territorial expansion. Given ample markets, that is, an ample source of raw material and ample opportunities for selling finished products, there is scarcely any conceivable limit to the density of urban population. As soon as markets are limited, urban populations are limited. The rivalry, therefore, of commercial and manufacturing nations is mainly concerned with markets. A great manufacturing and commercial nation can be built only on wide markets. Since the beginning of the present manufacturing and commercial era, statesmen have concerned themselves more with questions of interna-

tional trade and markets and spheres of influence than with territorial expansion. In agricultural nations, however, the problems of statesmanship and diplomacy have had more to do with territorial expansion than with markets.

Seasonal character of agriculture. The seasonal character of agriculture is more pronounced in temperate than in tropical regions, for the simple reason that the seasons themselves are more variable in the former. The fact that agriculture is a matter of times and seasons, gives great diversity and variety to rural work, and prevents that extreme degree of specialization which is one of the outstanding characteristics of the indoor industries. The specialized farm is the exception rather than the rule. Comparatively few farms are profitable unless various products are grown; but even on the so-called specialized farm, the character of the work changes from season to season from day to day, and even from hour to hour. The morning, the evening, and the middle of the day, each has its special task; the spring, the summer, the autumn, and the winter, likewise, bring their special demands and changes of occupation.

Its dependence upon space tends to make agriculture necessarily a business of small units, at least as compared with the indoor industries. The difficulties of superintendence are so great that it would be almost impossible to administer a farm employing 1,000 men, to say nothing of 10,000; yet indoor industries, where men are working close together, can be successfully administered where even larger numbers of men are employed.

An even greater difficulty in administration is created by the seasonal character of agriculture. Not only must each man be assigned to a new task at different hours of the day and different seasons of the year in regular order, but unexpected changes of weather occasion unexpected and almost instantaneous changes in the nature, importance and arrangement of the operations that make up the work of the farm. To direct even 100 men efficiently where these changes are continually occurring, would test the executive capacity, initiative, and resourcefulness of even the greatest administrator. Various mechanical aids in administration, automatic check devices, etc., may be used in indoor industries to lighten the burdens of the administrator, but these are impossible in agriculture. It is, therefore, pretty certain, that even though moderately large-scale farming might, under certain circumstances, succeed, it would still be an industry of small units as compared with manufacturing, mining, or transportation.

What is Good Agriculture?

What is good agriculture, from the standpoint of national prosperity? It is very easy to form a superficial opinion with regard to this question. A great deal has been written in recent years regarding the unscientific character of American agriculture as compared with that of older and more densely populated countries. Statistics of the yields per acre of the different countries are quoted, to the disadvantage of American agriculture, and, commonly, to the disadvantage of every other new and sparsely populated country.

But, before assuming that agriculture in all new and sparsely populated countries is as unscientific as is affirmed, we should ask ourselves whether production per acre is the only or the best test. If, instead of taking the product per acre, we should take the product per man, we should find that the new and more sparsely populated countries would head the list.

Product per man versus product per acre. There are many reasons for thinking that the product per man or per unit of labor is a better test of good or scientific agriculture than the product per acre. The yield per acre may depend upon a variety of physical and climatic circumstances, and may really have very little connection with the efficiency with which labor is applied. The product per unit of labor has a much closer connection with the efficiency of labor. Moreover, the standard of living and the general well-being of the agricultural class are determined more directly by the product per man or per family than by the product per acre.

There are some circumstances under which the product per man and product per acre are interdependent, where, in fact, they are inseparable. If we assume a fixed farm population and a fixed acreage of farm land, that is, a given number of people making a living off a given number of acres, then it must follow that the product per man can be increased only by increasing the product per acre, and the product per acre can be increased only by increasing the product per man. With a given population and a variable acreage, the product per man may be improved in some cases by increasing the acreage under cultivation, in other cases by decreasing it; that is, the agricultural population may spread over a wider area, or it may

abandon some of the land already under cultivation, if by doing either the one or the other it can increase the product per man. This would result, of course, in a larger acreage and more extensive cultivation in the one case, and a smaller acreage and more intensive cultivation in the other. Having the opportunity to cultivate as much or as little land as is found advantageous, the wisest policy would be for the population to spread over as much land as would enable it to produce the maximum per man.

The maximum product per man is generally found under conditions of somewhat extensive cultivation, that is, where the labor spreads itself over considerable land; but the inevitable result of this is that each acre of land receives comparatively little labor, or a small fraction of the labor of one man, as compared with what it would receive under intensive cultivation. This generally results in a somewhat small product per acre. Thus it frequently happens that a small product per acre and a large product per man are found in the same system of cultivation. If, for example, one farmer cultivates with his own labor 160 acres of land while another cultivates only 40, the 160-acre farmer may produce twice as much as the 40-acre farmer, even though he only gets one half as much per acre.

On the other hand, with a fixed acreage of agricultural land, but with a variable population, the product per man may be decreased or increased by increasing or decreasing the number of workers on the land. Under these circumstances, it is a good agricultural policy to put as many workers on the land as will enable them to produce the maximum per man.

Landowning and farming classes. The contrast between the results of intensive and of extensive cultivation indicates a rather clear and sharp conflict of interests between different portions of the agricultural population—between a landowning class, on the one hand, and a farming or laboring class, on the other. This conflict of interests creates a problem which can only be satisfactorily solved by the most careful consideration of the interests of both parties. It will certainly not be solved satisfactorily if the rural economist or the agricultural statesman listens to the arguments of one side alone. In those fortunate circumstances where the laboring class and the landowning class are one and the same, the problem is eliminated because the conflict is eliminated. That is, where every farm-owner operates his own farm and every farm-worker owns the land on which he works, there can obviously be no conflict of interests between a landowning and a land-working class; but, where one group owns the land and does not work upon it, and another group works upon the land which it does not own, a very definite conflict of interests arises. They who own the land are naturally anxious to increase the product per acre, if it can be done without too heavy an addition to the wage bill.

Cheap labor means poverty. A large supply of cheap labor makes possibe intensive cultivation where it would be economically impossible, were labor scarce and dear. In the former case, the owner can hire larger numbers of men to work his land, and can, therefore, cultivate it more thoroughly and get a larger product per acre and also a larger rent or income from the use of his land. But, from the standpoint of the workers, a large supply of cheap labor is decidedly undesirable. Cheap labor means poverty. When labor is scarce and dear, the workers are not in a condition of poverty. It is noteworthy that the countries which show a large product per acre are likewise the countries where labor is abundant and cheap, whereas the United States, Canada, Australia, and other civilized countries which show a small product per acre are the countries where labor is scarce and dear. The same thing may be stated in another way. The countries to which some of our popular writers and lecturers point as models of scientific agriculture because they show such large products per acre, are the countries in which the agricultural workers are in a condition of extreme poverty, whereas the countries to which they point as examples of unscientific or inefficient agriculture are the countries in which there is little or no poverty but a good deal of prosperity among the agricultural workers. We should hesitate, therefore, before we use the term "scientific" to describe a system of agriculture which is generally accompanied by the poverty of the workers on the land, even though it be accompanied by prosperity on the part of the owners of the land. It is almost a rule, although there are a few exceptions, that intensive cultivation and poverty go together, whereas extensive cultivation and prosperity are generally found associated.

The Law of Diminishing Return

The reasons which lie behind this fact are not far to seek. The chief reason is found in the great law of agricultural production known as the law of diminishing return from land. Stated roughly, this law is that in the cultivation of any given crop, such as corn, wheat, potatoes, or any other that might be named, you cannot increase the yield per acre in exact proportion as you in-

crease the labor used in cultivation. That is to say, you cannot double, treble, or quadruple the yield per acre by merely doubling, trebling, or quadrupling the labor used in its cultivation. If, for example, it should be found to be true that 1 man with 1 team could produce 40 bushels of corn to the acre on a given field, it might possibly be true, also, that 2 men with 2 teams, devoting their entire time to the same field, could double the yield and bring it up to 80 bushels per acre, though this is very doubtful. Three men with 3 teams, devoting their entire time to the same field, would certainly not triple the yield. Much less would 4 men with 4 teams quadruple the yield. But, unless the yield was actually doubled, tripled, or quadrupled as the labor force was thus increased, the necessary and mathematical result would be that the yield per man and team would be reduced. If, for example, 1 man with 1 team could produce 40 bushels, and 2 men with 2 teams could produce 70 bushels, the yield per man in the first case would obviously be 40 bushels multiplied by the number of acres, whereas in the second case the yield would only be 35 bushels multiplied by the number of acres. Again, if 3 men with 3 teams could force a yield of 90 bushels to the acre, the yield per man would be still further reduced to 30 bushels multiplied by the number of acres. And if 4 men with 4 teams could manage to secure a yield of 100 bushels to the acre, the yield per man would be only 25 bushels multiplied by the number of acres. The yield per man would, therefore, under the conditions which we have assumed, decline from 40 bushels to 25 bushels, multiplied by the given number of acres, as the number of cultivators was increased from 1 to 4.

The "marginal product." The average yield, however, is not the most important consideration. Economists are in the habit of using a somewhat technical term to describe the advantage of adding an extra man to the force already at work in the cultivation of a given field or farm. This technical term is known as the "marginal product." For this there is, unfortunately, no popular equivalent; it must, therefore, be explained at some length in nontechnical language.

One problem which the farmer who employs labor in the cultivation of his farm must consider,

is the addition to his total crop which should result from the addition of 1 man or 1 unit of

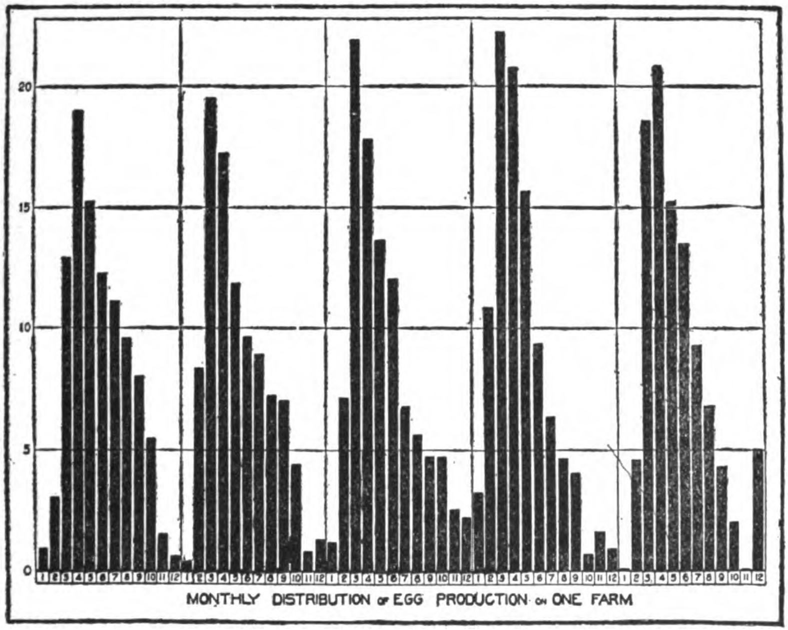


Fig. 75. There are some difficult features of the farming business that even the highest human efficiency cannot improve; the irregular distribution of its output is one of them. This chart shows the relative egg production by months for five years on one farm. (Wis. Bulletin 209.)

labor to his total force. Practically the same problem is involved in calculating how much the total product would be reduced by taking away one unit from his total labor force. It is at this point that he must consider carefully the problem of profits and losses. If by adding a unit of labor to his existing forces at a cost, say, of $100, he may reasonably expect to add more than $100 to the value of his product, it will be good business to hire the extra unit of labor. If, however, whatever the average product of all the units of labor may be, the addition of another unit to the total force will not add $100 to the total product, it will be poor business to employ it.

This may be reduced to arithmetical terms by assuming that in the figures given above we are considering a 20-acre field, upon which 1 man and 1 team can grow 40 bushels to the acre, or a total product of 20 times 40, or 800 bushels. However, if 2 men with 2 teams, under the above assumption, produce 70 bushels to the acre, the total product is 20 times 70, or 1,400 bushels. In this case, the average product is 20 times 35, or 700 bushels. But the additional product created by the second man and team is only 600 bushels; that is, the difference between 800, the product of 1 man and 1 team, and 1,400, the product of 2 men and 2 teams. The farmer who employs this second man will lose money on him, if he pays him more than the value of 600 bushels. Let us suppose that the farmer himself is the first man who works on the land. If he works it entirely by himself, he will have a total of 800 bushels; if he hires another man and team, and pays them more than for 600 bushels, he will have less for himself than he would have had if he had cultivated it alone.

Let us carry the analysis a step further, and assume that by hiring a third man with a team the farmer could get 90 bushels to the acre, or a total of 20 times 90, or 1,800 bushels. In this case, the average for the 3 men and 3 teams would be 600 bushels, but the third man would add only the difference between 1,400 and 1,800 bushels, namely, 400 bushels. It would pay the farmer better to get along with 2 men and 2 teams than to hire the third man and team, unless he could get this third man and team for the value of 400 bushels or less.

Finally, on the extreme assumption that 4 men with 4 teams could force a yield of 100 bushels to the acre, or a total of 20 times 100, or 2,000 bushels, while the average product of 4 men and 4 teams would be 500 bushels, the additional product resulting from the addition of the fourth man to the other 3 would be only the difference between 1,800, the production of 3 men and 3 teams, and 2,000, the production of 4 men and 4 teams. This would be only 200 bushels. It would obviously be unprofitable for the farmer to hire this fourth man, unless he could get him for the value of 200 bushels or less.

This additional product which results from the additional unit of labor is always less than the average product, and this additional product, rather than the average product, is the one which determines whether the farmer can afford to add to his labor force or not. If the labor of men and teams should be very cheap, our farmer could well afford to apply the labor of 4 men and teams to his field; if dear, he obviously could not afford to employ so many. This law of diminishing return, together with the fact that the marginal product is always less than the average product, is the underlying reason why land is generally cultivated intensively where labor is cheap, and extensively where labor is dear.

As the price of farm labor goes down, assuming that its efficiency is not correspondingly decreased, the advantages of owning land increase. Land tends to grow dear as farm labor grows cheap; but where labor is very scarce and dear, the rents or the profit of landownership are at the same time low. In other words, as farm labor grows dear, land grows cheap. If it happens that the average farmer is not a land-working and landowning farmer, but one class owns the land and another class does the labor, the conflict of in-

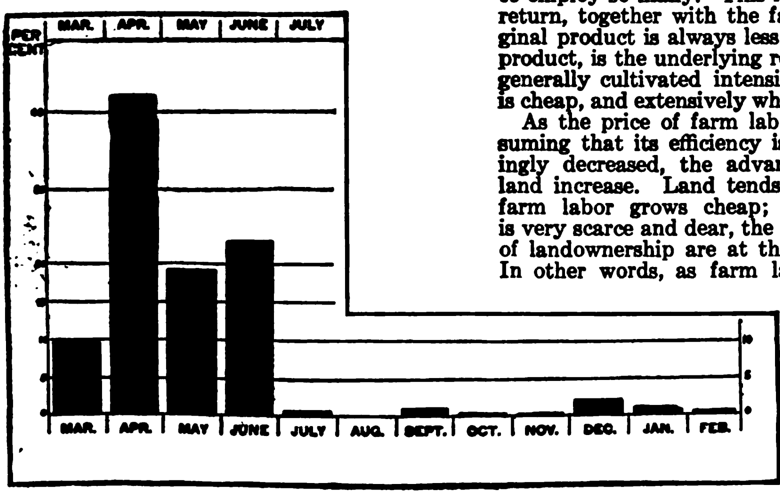


FIG. 76. As a result of irregular production, commercial practices based on farming activities also lack seasonal uniformity. This shows the relative quantities of eggs put into cold storage each month by a Chicago firm. (Wis. Bulletin 209.)

terests, referred to above, begins to grow acute. The working class will have an equally strong interest in reducing the supply and raising the price of labor.

Farmers should economize on scarcest factor. From the standpoint of the individual farmer who does not exercise control over the general conditions of agriculture, but has to accept them much as he finds them, it is always important that he should economize on the factor which happens to be most scarce. Where labor is scarce and dear, it is very important that each laborer be equipped not only with good and an ample supply of tools, but with plenty of land. It would be very poor economy to give a high-priced man a very inferior team and set of tools with which to work. It is equally uneconomical to give him a small quantity of poor land. New countries, where population is still sparse and labor, consequently, scarce and dear, are the countries in which agricultural science develops in the direction of labor-saving devices rather than of land-saving ones. Farmers, however, in countries in which land is scarce and dear, while labor is abundant and cheap, have a different problem to face. They must manage to get a large product from their expensive land. It would be very poor economy to apply to an acre of very expensive land a very small fraction of the labor of a man. In short, agricultural science in such a country naturally develops in the direction of land-saving devices. In a sparsely populated country, where land is cheap and labor dear, the scientific problem is how to get the maximum from the expensive factor, namely, labor. In densely populated countries, where land is dear and labor cheap, the scientific problem is, on the contrary, how to get the maximum product from the expensive factor, land. It is, therefore, no accident that agricultural machinery and labor-saving devices develop first in new and sparsely populated countries and are very slowly introduced in older and densely populated countries. Nor, at the same time, is it a mere accident that chemical fertilizers, deep tillage, scientific drainage, etc., reach their highest development in the old and densely populated countries.

Intensive cultivation, when to be encouraged. In times of national crises, when there is a dangerous scarcity of food supply, it may at first sight seem desirable that intensive cultivation be encouraged, in order that a larger food supply may be acquired. Intensive cultivation is to be encouraged whenever it can be carried on without reducing the product per man among the workers. This may be done by giving each man better tools and equipment and the use of more fertilizer; by the substitution, let us say, of larger for smaller teams, of horsepower for ox-power, of engine power for horsepower, we may enable a given number of men to cultivate a given area of land more intensively than would be possible without this change to a superior kind of power. By this means we may get not only a larger product per acre, but also a larger product per man. But, if instead of encouraging this method, our agricultural statesmen should encourage the mere massing of more labor upon the land, thus reducing the product per man, it will fail to add to the available food supply. For example, it is not the total product of the farm which will contribute to the feeding of the rest of the country, either in time of war or of peace. It is the surplus sold off the farm. If many laborers are massed on each farm, with a consequent reduction in the product per man, it may also result in a reduction in the surplus to be sold from each farm, more being required to feed and clothe the people on the farms. Thus the very purpose of increasing the nation's available food supply would be defeated.

In time of war, when a vast surplus of food is required not only for the armies, but for the munition workers and others who are taken out of the ordinary lines of productive industry, it is the quantity of this surplus which can be spared from the feeding of the farm population which is of extreme importance. This surplus is not likely to be increased by merely massing increasing numbers of men on the farms. The only scientific or successful way to increase this surplus is to cultivate more land or to give to each farm worker, as suggested above, a better equipment in the way of tools, fertilizer, and other aids to agricultural production.

It is a noteworthy fact that the very countries which have been held up as models of efficient agriculture because of their large product per acre, are those which have little to spare in the way of surplus food, owing to the large number of people on the farms who have to be fed, and the small product per man. On the other hand, the countries where extensive agriculture is carried on, are the only ones whose farms provide large food surpluses for the nonagricultural populations. There are relatively few people on these farms to be fed and clothed, and, at the same time, the product per man is relatively high; this necessarily leaves a large surplus which is available for feeding the armies, munition workers, and other nonagricultural people.

Land Tenure

From what was said above regarding the conflict of interests wherever the landowning class and the farming class are separated, it must have appeared

already that the problem of land tenure and of the relation of the workers to the land is a problem of first importance. There are 3 recognized systems in operation on a large scale in the chief agricultural countries of the world, each system having its merits and its demerits. In the first place there is the system with which we in the United States are most familiar, under which the farm-owner and the farm-worker are one and the same man. This is by no means universal, even in this country, but it may be said to be the typical or characteristic American system. It exists in some parts of Europe also, and is there called the peasant-proprietor system. Another system, quite familiar in this country, though not so distinctively characteristic as the farmer-owner system, is the landlord-and-tenant system; that is, the system under which one man owns the land, receiving rent for it, and another man assumes the business management, sometimes doing his own work, sometimes hiring his labor. In the latter case, the farmer is sometimes a large business man, hiring or renting the land on which he works, just as many a business man does in the city, and also depending mainly upon hired help as the typical business man does. The farmer in this case merely performs the dual functions of general business manager and capitalist. In other cases, however, the tenant hires practically no help, but does all the work on his rented farm with his own labor and that of his family. There is every gradation between these two extremes.

The third system is what we may call the managerial system, where the landowner does not rent his farm, but actually runs it as a business man. He may hire a manager or do his own work of management. In either case, he supplies not only the land, but the equipment, also, assumes the risks and responsibilities, and exercises at least some general supervision. The functions of landowner and business manager are combined in the same person.

The farmer-owner. From the standpoint of production, no system has ever proved so effective as the first-named, where the farmer owns his land, his equipment, and his livestock. The general experience of the world shows that he cannot be beaten in the field of production. He is at a distinct disadvantage, however, in certain phases of the commercial side of his business. He is not favorably situated as a buyer and seller. He who can buy and sell on a large scale has an advantage in bargaining over him who can buy and sell on a small scale only. It is very important that we should distinguish between efficiency in production and efficiency in buying and selling. The individual who buys on a large scale can generally attract the notice and secure the favorable attention of the people who have goods to sell. His custom is so desirable that dealers will give him special terms. On the other hand, the individual who buys only small quantities has much more difficulty in getting favorable terms and special quotations.

The problem of buying and selling is one of increasing importance in agriculture. In spite of his effectiveness as a producer, the small farmer who does his own work may find himself severely handicapped because of his inefficiency as a buyer and seller. Apparently his only remedy lies in organization and coöperation. This does not mean coöperative farming in the sense of coöperative production or coöperative work in the actual growing of crops and raising of livestock. It literally means coöperation in buying and selling, though occasionally some manufacturing may have to be done as an aid to the selling of farm produce. Coöperative farming or farm production has not succeeded on a large scale anywhere, but coöperative buying and selling has proved very successful wherever it has been given a fair trial. It gives the small farmer the same advantage in buying and selling which would otherwise be the exclusive possession of the large farmer. If the small farmer can secure this advantage, it is safe to say that he can never be driven out by the competition of the large farmer, for the reason that, as a producer, he is quite as efficient as, if not more efficient than, the large farmer, at least on the average and in the long run.

Landlord-and-tenant system. The system of landlord and tenant has some advantages, provided the landlord assumes a real function in the farming business. A large farm-owner who selects his tenants carefully, exercises some supervision, and devotes time and energy and brings his superior intellect to the study of the larger and more scientific aspects of farming, may be of great help to his

tenants; and it is not impossible that a tenant might prosper more under such a landlord than as an independent owner. That is, the disadvantage of having to pay rent might be more than compensated by the advantage of having a highly trained scientific expert and public-spirited man as an adviser. The landowner, not having to give much attention to the details of running the farm, may become a specialist in some of the larger aspects of agriculture; at the same time, the tenant, being relieved of this kind of work, may devote himself exclusively to the detailed management of the farm. Thus, both he and the landowner become specialists and experts. Again, the landowner may become a natural leader in agricultural enterprises, such as coöperative buying and selling, whereas in many a community of landowning farmers no natural leader is found and coöperative organization is, therefore, difficult to carry on.

Absentee landlordism. We have presented the landlord-and-tenant system in its most favorable form. At the other extreme we have what is known as absentee landlordism. Under this system the landlord not only lives entirely apart from his land, and therefore takes very little interest in it except to collect his rents, but he performs no useful function whatsoever in agricultural development. Since he lives somewhere else, and spends his income somewhere else, the land is drained of its surplus income, and little is done to improve the living conditions in the rural community where his land lies. There can be no hesitation in saying that absentee landlordism is the worst system that can possibly be invented or that was ever in practice in any rural community, unless it be that of chattel slavery. If, in addition to absentee landlordism, the lease system is also vicious, that is, if the leases run from year to year rather than for a period of years, the evils become intensified. Neither blight nor pestilence, drought nor flood, war nor famine can more effectually destroy everything that is desirable in rural life than absentee landlordism combined with a bad system of leases. The landlord spends the income which he derives from the land elsewhere, and he has no interest in building up the social life of the community. The tenants move year after year; consequently, they have no interest in building up the community where they happen to live at any one time. Between the absentee landlord and the one-year tenant, the rural community is robbed of everything that makes life worth living.

The mere fact that the landlord lives on his land almost of necessity has a beneficial influence not only upon himself, but upon the whole community. In the first place, the surplus produce of the land in the form of rent is spent on the land where the landowner's home is. Again, since this is the landowner's home, he must necessarily take a vital interest in his own home surroundings. He, therefore, has an interest in the general social conditions of the rural community. He could hardly enjoy life if he allowed even his farm animals to be miserable; much less could he enjoy life if his tenants and the farm laborers were miserable. For his own protection, therefore, if for no other reason, he must take an interest in the general comfort and welfare of the people who live on his land.

Between the ideal landowner who lives on his land, devoting his time and energy to the study of agricultural problems and to advising and helping his tenantry, and, on the other hand, the absentee landowner, who takes no interest in the land except as a source of income, and no interest whatsoever in the general social conditions of the community, there is every gradation. Taking the landlord-and-tenant system as a whole, as we find it in the different parts of the world and as it must be expected to develop, it is a less desirable system than the system under which the farm-worker and farm-owner are the same person. This, however, is quite consistent with the proposition that the landlord-and-tenant system at its best is better than the other system at its worst, but this would not be a fair comparison. The landlord-and-tenant system at its best is certainly no better than the farmer-owned system at its best, whereas the landlord-and-tenant system at its worst is immeasurably worse than anything in the way of farm-ownership.

The managerial, or capitalistic, system. The managerial system, sometimes called the capitalistic system, has never developed as have the other 2 systems. The difficulties of administration, especially where labor is scarce and hard to find or restive under discipline, generally discourages the capitalistic farmer, causing him either to sell his land in small parcels to individual proprietors or to lease it to farmers who farm on a small scale and, therefore, have less trouble with the labor problem. The plantation system of the South, as it developed during the days of slavery, gave way under freedom in a characteristic manner. When the labor forces could be held under discipline, the plantation proprietor could make a success of his system; but, when it could not be held under the same rigid discipline, the problem was solved by transferring the free laborer into a small tenant who was, within rather narrow limits, it is true, his own boss and who felt the incentive of profit and loss, prosperity or hunger, as a driving motive. This may be taken as an extreme example, but much the same problem arises wherever the capitalistic proprietor tries to run a large farm with hired help. If he is particularly skillful in the handling of men, or can secure a superintendent who possesses that skill, he may succeed reasonably well. But the general tendency has

been to give up the struggle, as the southern planter did, and either sell his land in small parcels to individual farmers or lease it to them and let them wrestle with the labor problem themselves.

Advantages of the middle-sized farm. Aside from the question of ownership, the question of large-scale or small-scale farming is one of great importance. Large-scale farming, of course, tends to become capitalistic. The farmer, whether he be owner or tenant, must, almost of necessity, specialize on the work of superintendence and management and depend upon hired labor for the manual work of the farm. In those extremely large farms where large numbers of men have to be employed, the evidence seems to show that in the long run they are not successful. On the other hand, there is much evidence in favor of what we may call the middle-sized farm, that is, a farm whose acreage must depend greatly upon the type of farming carried on but which, whatever the acreage, involves the hiring of considerable help, at least at certain times of the year. On the other hand, they are not so large but that the farmer himself together with his family performs a fair proportion of the manual labor. Such farms are not characteristically capitalistic. That is to say, the farmer himself actually works with his hands and does not devote himself exclusively to the function of the capitalist. Nor does he hire so many men as to create for himself a distinct labor problem. There is thus preserved a sort of comradeship or fellow-workmanship between employer and employed. Such a farming enterprise gives to the farmer himself scope for the exercising of business talent and the means of earning a larger income for himself and family than he could ordinarily earn if he did not hire considerable help. At the same time, it furnishes an opportunity for the hired man, especially if he be young and ambitious, to serve an apprenticeship under a capable and successful farmer.

As stated above, the acreage of a middle-sized farm must vary with the type of agriculture carried on. In market gardening or truck farming, it might range from 20 to 80 or 100 acres; the value of suitable land is often the limiting factor in this case. In hay, grain, livestock, and cotton farming, from 320 to 640 acres. In cattle ranching, the acreage could of course run up into thousands and tens of thousands.

The Marketing of Farm Products

There are two very distinct and easily understood methods of selling goods. The first and more primitive is that of selling on inspection; the second and more highly developed, that of selling on grade and reputation. There are, of course, a good many variations and combinations of both methods.

Selling on inspection. When the farmer produced for local consumers and could haul his produce directly to the consumer, show it to him, and let him look it over and inspect it, the primitive method of selling on inspection was not so very uneconomical; but when the producer and consumer are so far apart geographically as to make it impossible for them to meet and barter directly with one another, this method becomes very unsatisfactory and uneconomical. The middleman, in one form or another, then becomes a physical necessity; and, if the method of selling by inspection continues, it is pretty certain that there will be a chain of middlemen between the producer and the consumer. That is to say, if every time a product is transferred from one person to another, it has to be inspected or be sold by inspection, a

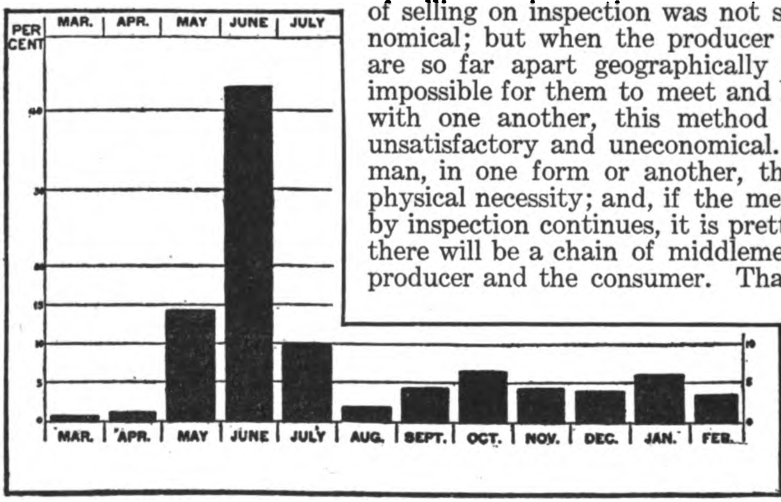


FIG. 77. Relative quantities of butter put into cold storage each month by a Chicago firm. As with eggs (Fig. 76), the largest purchases are made when the supply is greatest and the price lowest. (Wis. Bulletin 209.)

considerable chain of buyers and sellers must necessarily intervene between the producer and the ultimate consumer. It, therefore, becomes increasingly important that the method of selling on grade or reputation should as rapidly as possible replace that of selling on inspection.

Selling on grade or reputation. An article is sold on grade or reputation when the buyer does not care to examine it, but is willing to buy it because it has been graded and bears a certain brand or name or guarantee of quality. Where this can be done, large quantities can be transferred from one person to another at a minimum of cost. A producer may sell to a far-distant consumer, if the consumer has sufficient confidence in the producer's ability to grade properly and in his reputation for honesty and responsibility. Without this establishment of mutual confidence, however, this most economical of all methods of buying and selling is an impossibility. Confidence and the honesty which begets that confidence are among the greatest of all labor-savers.

Grading and standardizing. Some articles, however, are incapable of being satisfactorily graded and standardized. Breeding animals, for example, must each one sell on its individual merit and can probably never be sold without inspection. But in the large markets of the world, where vast quantities of goods of great value are transferred at a minimum of cost, it will be found that the dealings are always in goods that can be graded and standardized, bought and sold without inspection.

"Whatever differences of opinion may exist with respect to other functions of government, little is said or to be said against coining money and fixing the standards of weights and measures. . . . Both result in great economy of effort in the transfer of goods. . . . Coining the metal merely enables it to pass from hand to hand without the labor of inspection, that is, without weighing it to determine its quantity and without testing it to determine its quality. It 'sells'—if we may speak of selling money—on grade and reputation rather than on inspection. It is the most salable of all commodities, and the fact that it is so standardized as to make inspection unnecessary on the part of the 'buyer' has a great deal to do in giving it its superior salability. By the same process of standardization, any other commodity may approach gold coin in salability, though it may not quite reach it. At least it is safe to say that whenever it can be sold entirely on grade and reputation, and absolutely without inspection, its salability will be enormously increased.

"A short step is taken in the direction of standardizing other commodities when the state establishes uniform standards for determining quantity, that is, when it fixes the standard of weights and measures. Without some uniform system even our present methods of selling would be much more clumsy and wasteful. Every buyer would have to have his own system for determining the quantity of his purchases. . . . Coins are standardized not only as to quantity, but as to quality as well. There is no probability that any government will be called upon to do that which would be analogous to coining money—actually put up other commodities in standardized packages. Something is to be said in favor of fixing standards of quality as well as standards of quantity.

"The reasons in favor of fixing standards of quality, wherever it can be done, are identical with those in favor of fixing standards of measuring quantity. They are all summed up in the superior economy of buying on grade and reputation as compared with buying on inspection. The buyer of an unstandardized commodity may have enough confidence in the seller's system of weights and measures to avoid the necessity of weighing and measuring for himself; but he can scarcely avoid the necessity of inspecting the commodity in order to determine its quality. In some cases, the determination of its quality is easier than that of its quantity, but in other cases it is not. In all cases where quality can be standardized, there is economy of effort. So far as buyers can be saved the trouble of inspection, so far will they be enabled to economize the time and effort involved in making purchases, and so far, also, will the salability of commodities be increased. Whether this will reduce the cost of getting the standardized commodities from producers to consumers, or merely enable the consumers to use their time more advantageously to themselves, may be open to question; but the ultimate economic effects are much the same in either case.

"Not the least among the advantages of a minute division of labor is the fact that each individual can avoid the necessity of being expert in many things and therefore has time to become a specialist in one thing. One of the advantages of the standardization of commodities is that the average consumer can avoid the necessity of being an expert judge of the many articles which he has to purchase. He may, therefore, utilize his time and mental energy in his own special field of work. There is, to be sure, something attractive in the custom of the well-to-do

burgher going to market and selecting with the eye of a connoisseur the various articles needed by his household; but it is wasteful of time and mental energy. When he or his housekeeper is able to order by telephone, without any inspection whatever, and still get what he wants, more time is left for other things.

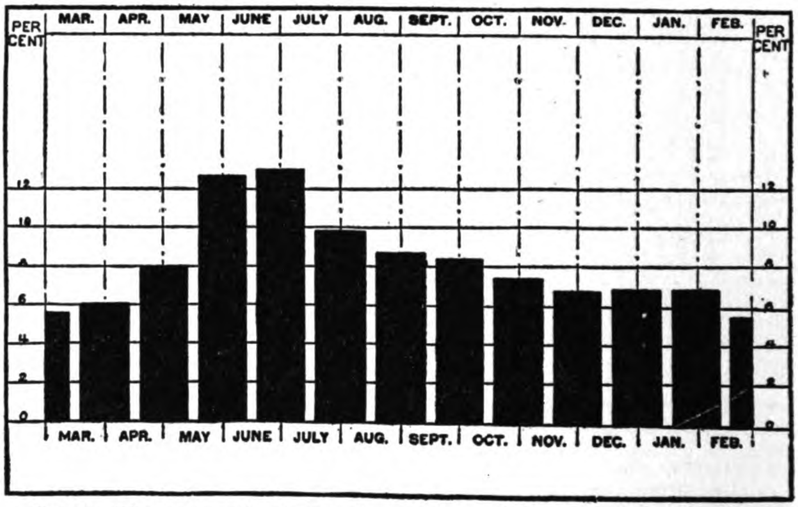


FIG. 78. Winter eggs, milk, etc., have been made possible by careful and persistent breeding, feeding and management; were farmers to relax their vigilance nature would again take charge. This chart shows the relative amounts of milk brought to the University of Wisconsin creamery, and emphasizes the period of greatest natural production. (Wis. Bulletin 209.)

"This will help to explain 2 very distinct tendencies in present-day retail marketing methods. The first is to put more and more articles up into standardized packages. The second is to place more and more dependence upon the retailer, who, in many cases, is coming to regard his customers as clients to whom he is bound to give his own expert service. Both tendencies are designed to save the consumer the trouble of becoming an expert buyer. Neither tendency has, as yet, reduced the cost of getting products from producer to consumer. If the consumer utilizes the time saved in earning a larger income with which to purchase goods, it perhaps does him as much good as it would if these tendencies merely reduced the price of commodities.

"One reason why these tendencies merely save the time of the consumer rather than reduce the cost of getting the products to him is, that the standardization takes place only in the last stage of the process, that is, just before the commodities reach the consumer. In order to reduce materially the spread between the prices which the producer gets and the consumer pays, standardization must take place early in the process.

"A good illustration of the effect of standardizing a product early in the process of getting it from the producer to the consumer is found in the marketing of California oranges. They are graded and standardized as soon as they leave the orchards. All subsequent inspection is therefore unnecessary, and the cost of getting them to the consumer is reduced practically to the physical cost of haulage and handling. This has notably reduced the spread between the two prices. Many other commodities, such as wheat, cotton, pig iron, and coal, are largely sold on grade rather than on inspection. In these cases, the government has had very little to do with the standardization. Two recent acts of Congress, however, have brought the government definitely into this field as the fixer of standards of quality. These are the Cotton Futures Act and the Grain Standards Act. Both give the Secretary of Agriculture power to establish grades and to enforce their use in the regular channels of trade. A number of states, also, have passed grading laws of various kinds."*

Financing the Farmer

In order that the capital of the country should yield its maximum service it should distribute itself among the different fields in proportion to its opportunity for profitable use. There is a close analogy between this principle governing the distribution of capital and the principle which governs the distribution of any other commodity that is useful in production. Let us take the use of water in irrigation. A limited supply of water in an irrigated region

*From "Standardization in Marketing," by T. N. CARVER, in *Quarterly Journal of Economics*, Vol. XXXI, No. 2, February, 1917.

will yield a larger total product if it is restricted to such areas as yield the maximum crops and, roughly, in proportion to the productivity of the different fields. If, for example, one field will yield 50 bushels of wheat to the acre, whereas another will yield only 25, and there is not water enough for both, it is much better for the community that all the water should go to the 50-bushel field. To allow part of it to go on the 25-bushel land, thereby cutting off the supply of some of the 50-bushel land, would be a distinct waste of this valuable resource. Again, to allow a farmer who with good land could only produce 25 bushels to the acre to have water, and thereby deprive some other farmer who with land of equal quality could produce 50 bushels to the acre, would involve just as great a loss or waste of water. In the competitive process it is pretty certain that the 50-bushel farmer could afford to pay a higher price for the water than the 25-bushel farmer; and it would be to the interest of the community that he should do so, just as truly as it would be to the interest of the community that the farmer with the 50-bushel land should buy the limited supply of water, thus depriving him whose land is capable of procducing only 25 bushels to the acre.

The same law applies to the distribution of capital. It should flow into the different fields of enterprise and production according to the degree of productivity found in each field. If agriculture is so oversupplied with capital that farmers cannot afford to pay more, let us say, than 3 per cent for it, whereas other business men can afford to pay 5 or 6 per cent, obviously more capital ought to go into other lines of business and less into agriculture. But if farmers can afford to pay 6 or 7 per cent, whereas other lines of business can afford to pay only 4 or 5 per cent, it is important that increasing quantities should be diverted to agriculture.

Standard forms of agricultural securities needed. If there were no disturbing factors in the laws of the market, capital would tend to distribute itself between the two fields of enterprise, agriculture and urban business, in such proportions as would enable it to yield approximately equal rates of interest in both fields. But, if there are disturbing factors, it may flow in undue proportions into one field instead of distributing itself properly between both. There have, undoubtedly, been disturbing factors in our national economy which have hindered the flow of capital into agriculture and tended to divert it into other lines of business even though at lower rates of interest. One of the most important of these has been the lack of standard forms of agricultural security. The principle (explained under "The Marketing of Farm Products") of selling on grade rather than on inspection, applies just as well to the selling of securities as to the selling of material commodities. A security that can be standardized and sold on grade will sell much more readily than one which can only be sold on inspection. The ordinary industrial securities tend to become standardized and to sell on grade. The result is that the inexpert buyer may safely invest his capital in any of them. The form of security offered by the agricultural industry in the past has been the farm mortgage. This is unstandardized and cannot be sold except on inspection. The inexpert investor or the investor who is too busy to take the time to inspect the farm and the title to the land, and to investigate other factors affecting the security does not dare to buy a farm mortgage. Only those few who are favorably situated for the work of inspection and who have some little expertness in it are in a position to buy the form of security which the farmer has had to offer. But any one who has managed to save up $100 or so may invest in some form of industrial security without much risk. This has seriously hindered the flow of capital into agricultural industries.

Various private organizations have intervened in order to fill the gap. The large company with a good reputation for solvency can put its own experts into the field to inspect farms, titles, etc., and to buy farm mortgages. When thus inspected and bought, they are excellent security; but they would be very poor security for the investor who had neither time nor ability to do the inspecting. This company, however, issues its own securities on its own reputation, selling them to the general public. These securities possess one great advantage over the mortgage, that of salability; and this salability is due to the fact that they are sold on grade and reputation rather than on inspection. The inexpert buyer will buy these securities when he would not buy individual farm mortgages.

This, however, has only partially met the difficulty. The Federal Farm Loan Act is the first constructive piece of national legislation dealing with the problem of properly financing the farmer. The securities of the Farm Land Banks, being under the supervision and inspection of the Federal government, will sell on grade and reputation rather than on inspection. The general investing public may, therefore, buy this form of security with the same confidence with which it now buys other standardized industrial securities. This, in turn, will enable the capital of the country to flow into agriculture with the same freedom with which it now flows into other industries. The Farm Land Banks, through the organization of local farm loan associations and through their own inspectors and appraisers, will become expert buyers of the unstandardized mortgages. Thus the farmer's unstandardized security will be virtually transformed into a standardized security before it is offered to the general public. That is to say, when the Farm Land Bank accumulates a certain number of farm mortgages it may issue its own bonds with these mortgages as security and offer these bonds in standardized form to the investing public. This will put the farmer on an equal footing with the urban business man in the effort to secure capital for his business.

How to Get and Use Credit

"There is no magic about credit. It is a powerful agency for good in the hands of those who know how to use it. So is dynamite. They are about equally dangerous in the hands of those who do not understand them. Speaking broadly, there are probably almost as many farmers in this country who are suffering from too much as from too little credit. Many a farmer would be better off to-day if he had never had a chance to borrow money at all, or go into debt for the things which he bought. However, that is no reason why those farmers who do know how to use credit should not have it.

"There is no mystery about credit or capital. Capital consists of tools and equipment, though sometimes we speak of it as though it were the money necessary to buy the tools and equipment. Capital and land are the factors which call for investment by the farmer. Thus the large use of capital in farming has come because of the invention of agricultural machinery. When farming was done with a few very simple tools, most of which were made either by the farmer himself or by the local blacksmith, capital did not play a large part in agriculture. . . . It did not take much money to buy all the equipment the farmer needed or knew how to use. The purchase of land was the only thing requiring much money, and land in this country was either free or very cheap. Therefore, very little money was required for a start in agriculture. At the present time, not only is the price of land rising, but the equipment of a farm requires more capital because of the increased use of improved machinery.

"Capital is brought into existence in only one way—that is, by consuming less than is produced. If one has a dollar, one can spend it either for an article of consumption, say confectionery, or for an article of production, say a spade. He who buys a spade becomes a capitalist to the amount of the value of the spade—that is, he becomes an owner of tools. The process is precisely the same, whether the amount in question is a dollar or a million dollars. If he does not have the dollar, his only chance of getting the spade is either to borrow it or borrow the money with which to buy it. That is, he must use credit. Again, the process is precisely the same, whether the amount be a dollar or a million dollars.

"There are, therefore, only two ways of securing capital for the equipment of a farm. One is to accumulate it oneself, by consuming less than one produces; the other is to borrow it. The advantage of borrowing is that one does not have to wait so long to get possession of the tools and equipment. One can get them at once and make them produce the means of paying for themselves. Without them, the farmer's production might be so low as to make it difficult ever to accumulate enough with which to buy them.

"Shortsighted people, however, who do not realize how inexorably the time of payment arrives, who do not know how rapidly tools wear out and have to be replaced, or who do not keep accounts in order that they may tell exactly where they stand financially, will do well to avoid borrowing. Debts have to be paid with deadly certainty, and they who do not have the wherewithal when the day of reckoning arrives, become bankrupt with equal certainty.

"On the other hand, there is nothing disgraceful about borrowing for productive purposes. The feeling that it is not quite respectable to go into debt has grown out of the old habit of borrowing to pay living expenses. That was regarded, perhaps rightly, as a sign of incompetency. It was then natural that men should not like to have their neighbors know that they had to borrow money. But to borrow for a genuinely productive purpose, for a purpose which will bring you in more than enough to pay off your debt, principal and interest, is a profitable enterprise. It shows business sagacity and courage, and is not a thing to be ashamed of. But it cannot be too much emphasized that the would-be borrower must calculate very carefully and be sure that the enterprise is productive before he goes into debt.

"In the payment of a debt it is not the interest, but the principal, which gives the greatest trouble, except where interest rates are exorbitant. If a man borrows $100 for a year at 7 per cent, he has to pay, at the end of the year, $107. If he borrows at 5 per cent, he has to pay $105. The difference is $2. Now, $2 is not to be despised. Good business consists, in large part, in looking after just such items as this. Nevertheless, it is only a little harder to pay $107 than to pay $105. The point is that the principal is the same in either case, and it is the principal which gives the greatest trouble.

"The reason it has seemed necessary to emphasize this elementary fact is that many people seem to imagine that if interest on farm loans can be reduced from 7 per cent to 5 per cent, or from 6 per cent to 4 per cent, conditions will be made easy for the farmers. It is important that interest rates be lowered wherever it is economically possible, but it is vastly more important that farmers should learn how to pay back the principal easily. The only way to do this is to use the money borrowed in such a way as to put one in possession of the means of repayment. If the $100 which a man borrows is spent for fertilizer, which adds $125 to the value of his crop, he should not find any great difficulty in repaying the loan, both principal and interest. If he uses it in such a way as to add only $75 to his crop, he will have some difficulty in repaying the principal, to say nothing of the interest. An unproductive enterprise is not a safe basis for borrowing under any conditions.

"The first and most important rule to be observed, therefore, in the use of farm credit is to make sure that it is for a productive purpose, that is to say, *make sure that the purpose for which the borrowed money is to be used will produce a return greater than needed to pay the debt*. Except in extreme cases, it is bad policy to borrow in order to purchase anything which will not help to pay for itself. As a rule, the purchase of these things should be postponed until the farmer has accumulated the wherewithal out of his own earnings.

"But if he borrows money to buy fertilizer and agrees to repay the loan before his crop has been harvested and sold, he may have difficulty in repaying it. One in such a predicament has three possibilities open to him. He may receive money from some other source at the time the loan falls due; he may get the loan extended or the note renewed; or he may be sold out by his creditor. The first is not altogether desirable, because it violates an important principle of business management, namely, that each part of the business shall provide the means of paying its own expenses. The second is undesirable, because it puts him in the position of requesting a favor of his creditor, whereas all business arrangements between man and man ought to be so clear and so definite that neither shall need to ask special favors of the other. The third needs no comment.

"This brings us to the second rule to be observed in the use of farm credit. The contract should provide for the repayment of the principal at the most convenient time; that is, when the farmer is most likely to have the means wherewith to repay it.

"The third rule is closely related to the second. It has to do with the duration of the loan. If a man borrows to buy fertilizer which is to be used up in one year, the loan ought not to run for more than a year. If he is not able to pay the loan with his first crop, he will never be in a position to pay it, unless he draws upon some other source for the money. This violates the first rule. Again, it should not be for a shorter period than the growing season of the crop; for that would violate the second rule. If he borrows for the purpose of buying a twine-binder which will help in the harvesting of several grain crops, each crop should not only pay the an-

nual interest charge, but a part of the principal as well. A small loan of this kind, for an investment which lasts only a few years, may not give much trouble and may not require any special method of repayment. But a heavy loan, for the purchase of land or the making of costly and durable improvements, may lay a considerable financial strain upon the farmer. Any method which will relieve that strain is, therefore, important.

"In order to reduce the strain as much as possible, the loan should be for a long period of time. In no case, of course, as stated above, should the loan outlast the improvement. If the borrower wants the money to build a silo, and the silo will last 10 years, the loan should not be for more than 10 years. It is better to err on the safe side, if at all, and pay the debt off in less than 10 years rather than to let it run too long. If the silo will not pay for itself in that time, it never will. On the other hand, it can scarcely be expected to pay for itself in one or two years. Unless the borrower has other resources, it would be a financial strain if his debt had to be paid so soon. *The length of time the debt is to run should have a close relation to the productive life of the improvement for which the money is borrowed.* This will do away with the necessity of having the loan frequently renewed, and it will free the borrower from subjection to an unscrupulous lender who might refuse to renew a short-time loan and insist on foreclosure.

"The fourth rule is that *provision should be made in the long-time loan for the gradual reduction of the principal.* There are two well-recognized ways of doing this. One is to provide in the note that, on any interest date, the borrower may, if he so desires, repay a part of the principal. As the principal is gradually reduced, the annual interest charge is likewise reduced, and by paying the same sum annually, the debt is gradually wiped out. Another method is to provide in the note itself for a definite rate of amortization by fixed annual or semiannual payments. Each of these fixed payments not only pays the interest, but a small part of the principal besides, eventually wiping it out completely. Farmers are strongly advised, in all long-time loans, to insist on one or the other of these methods of repayment. It may be necessary to organize and work together in order to secure these and other favorable terms.

"The fifth rule is that *as low interest rates as possible should be secured.* While this is obvious enough, it is apparently not quite clear to a good many farmers just how to secure low interest rates. Interest rates, like prices in general, depend upon the law of supply and demand. When there is more loanable capital in a community than is wanted by the borrowers of that community, the rate of interest is low and the borrowers can dictate terms. When there is less loanable capital than is wanted by borrowers, interest is high and the lenders dictate terms. Obviously, therefore, it is to the interest of the borrowers to increase the number of lenders, or, at least, to increase the amount of loanable capital in their community. The way to increase the supply of loanable capital is not to denounce lenders and hold them up to public hatred. That is like throwing clubs at chickens, to cure them of shyness and make them come when they are called. The right way is just the opposite of that; it is to make the neighborhood attractive to lenders, so that they will be anxious to come. Then the borrowers will be able to secure favorable terms. So long as lenders are hated, so long as borrowers habitually try to beat the lenders and force them to resort to legal proceedings to collect, just so long will the right kind of lenders avoid such a community, interest rates will be high, terms unfavorable, and foreclosures frequent. The only kind of lenders who will go to such a community are the loan sharks, who go in for the purpose of taking advantage of high interest rates and who watch for chances to foreclose mortgages.

"The point to remember is that the farmers have it within their power, to a large extent, to remedy these conditions themselves, though it may take some careful planning and hard work. In the first place, they must disabuse their minds of the notion that tangible property, such as land, furnishes the best security in the world. The business ability and character of the borrower are of even greater importance in such transactions than the value of the land he may own. Where farmers are known to be capable of paying their debts, and willing to do so promptly and without legal proceedings, there credit conditions are good, because the right kind of lenders are attracted. Lenders of the right kind do not like to foreclose mortgages or resort to any form of legal procedure. They will avoid any neighborhood where such things occur frequently, leaving it to others less considerate. The right kind of money lender merely wants his principal back, together with the stipulated rate of interest. Where these are assured to him without the vexation of legal procedure, he will go.

"It must be admitted, however, that one farmer can do very little, when working alone, to give his neighborhood a better financial reputation, or to attract the right kind of lenders. This is a problem which must be worked out by the whole community, or, at least, by a considerable group of men. If ten men cannot be found in a community who have confidence in one another, how can they hope to find lenders from the outside who will have confidence enough in that community to risk lending money there?"*

* From "How to Use Farm Credit," by T. N. CARVER, in Farmers' Bulletin 593, June 3, 1914.

FIG. 79. Community breeding and advertising make for better farms, better farmers, better livestock and better business

CHAPTER 9

The Neighborhood as a Business Asset

By WILLIAM L. NELSON, *farmer, agricultural writer and U. S. Congressman from Missouri; formerly of the Extension Department of the College of Agriculture of the University of Missouri. For 10 years Assistant Secretary of the Missouri State Board of Agriculture; author of the first farm name registration law; contributor to the "Breeder's Gazette" and other farm journals; and, throughout his life, a practical, successful farmer and a friend, confidant and helper of other farmers. Born and reared on a farm in one of the richest sections of one of our greatest farm states, he has traveled and observed conditions over much of the country, especially those conditions that constitute and influence the social life of farm communities. The men and women and children that live on farms are no less human than those who live in cities; they form a part—and a big, important part—of society; and their social development must be sound and well-balanced if the foundations of the nation's prosperity are to stand unshaken. The life of the rural community, and its organization in the neighborhood, is a tremendous but all too often overlooked factor in the success or failure of the individual farms that make it up. Mr. Nelson writes of a fundamental factor in the business of farming; and from long experience and close observation, he knows whereof he writes.*—EDITOR.

THE neighbor is the "near-dweller." In the long ago, when our language was taking form, the "bour" section of the double word, as "neighbour" (now spelt without the u), meant "farmer" or "rustic." It was then that people settled near together for mutual protection and benefits. Thus they became near dwellers or neighbors.

The early neighborhood. The custom of forming agricultural villages or neighborhoods was first known in Asia and Europe, and was brought to America by the first white settlers who came to make their homes in the new land. The causes that led to the founding and growth of neighborhoods were much the same in both hemispheres. In the Old World there was, for a long time, need of protection from bands of robbers, just as the first settlers in America found it necessary to build their homes close together, perhaps around a stockade or fort, as protection from the Indians. In some sections, wild animals, also, endangered the lives of settlers whose homes were far apart.

There were additional reasons why, in those early days, neighborhoods were formed. The lone settler could not enjoy the privileges and advantages of church and school. With all the people coöperating, however, the neighborhood might have its preacher or priest, together with its physician to look af-

ter the ills of the body. There were, also, advantages which came of neighborhood barter and trade. So, even in that early day, the neighborhood became of considerable importance as a business asset.

The new neighborhood. To-day, the neighborhood is not limited to such narrow boundaries as was the neighborhood of the past. This is due largely to improved methods of getting about by land and water, to the building of better highways, and to the use of the automobile. The twentieth-century "day's journey" differs greatly from that of Biblical times.

These differences, though, are not greater than the changes in the neighborhood itself. Where, in the olden times, only near neighbors traded with one another, trade is now carried on between widely separated neighborhoods, and between distant states and countries. Hence it is the world demand, rather than the neighborhood supply, that fixes prices.

No man lives unto himself. The farmer whose home may be in some out-of-the-way neighborhood is interested in the wool clip of Australia, the beef supply of Argentina, and the wheat crop of Russia. The people of those countries buy and sell in the same markets that he does. Consequently, he needs to know something of them and of their crops. Working alone, it would not be possible for him to get much information, but, through community effort and the joining of neighborhood forces with still larger organizations, he gets market reports telling him just what he wants to know about crops, yields, and prices. Such things multiplied many times over prove how important is the neighborhood.

What makes a good neighborhood? How often do we hear said of one community, "That is a good neighborhood," while of another the comment is made, "I would not care for that neighborhood." What, then, are the things that make us prefer one neighborhood to another? What are some of the ways in which neighborhoods differ? If about to choose a location for a farm home, what are some of the things for which we should look? In other words, what is in one neighborhood that adds to the value of property by making people want it, and what is it in another neighborhood that produces just the opposite effect?

Remembering that no country produces a better crop than its inhabitants, we, first of all, turn our attention to the people. Taking for granted that we, ourselves, are progressive, law-abiding, and generally desirable citizens, we may ask, "Are they our kind of folks?" Are their ideas and ideals, their moral standards, their customs and manners somewhat like those we have chosen for ourselves? These are not the things that are usually spoken of by the real-estate agent or promoter; but, especially to the man with a family, they are of more importance than soil fertility or markets. Land and buildings do not make a neighborhood any more than brick and mortar make a home. So, in trying to find out about the neighborhood, we ask about other things. Are the standards of the people right? What of Sunday observance, of respect for law, of temperance and frugality, and of patriotism? The answers to these questions may help us to decide whether or not the neighborhood is one in which we would care to live. Nobody wishes to settle in a community where feuds and fusses are common or where serious factions exist among the farmers. In brief, nobody wants to buy a lawsuit with his land.

Because all of us are more or less influenced by the people among whom we live, we are interested in the ideals of the neighborhood. Are they high or low? If the people believe in high ideals, in the right, do they stop with just believing or are they willing to fight for the right? These are proper questions, for long-established neighborhood customs and viewpoints are hard to change, at best.

Is the neighborhood one of home owners or is it one of city landlords and of renters whose leases run only from year to year?

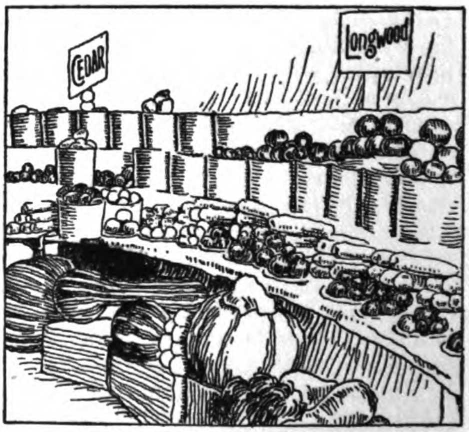


FIG. 80. By competition at fairs and rural meetings, neighborhoods develop increased ability to progress, as well as greater friendship and unity of purpose.

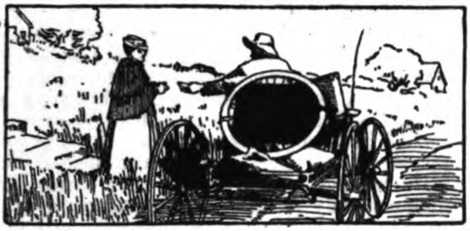


FIG. 81. The telephone, the automobile, the rural free delivery—everything that keeps one family in touch with another, helps along the spirit of neighborliness.

This is an important matter. In a neighborhood where most of the people own their own homes, a larger proportion are apt to be willing to contribute of their means toward the public good. This is because there is a prospect that they will be able to share in these things for a longer time. Again, men who live in the same place for a term of years are likely to be more able to help neighborhood upbuilding than are those who are always on the move.

What of the standards that the community has set up as regards success? Is wealth, as represented in land and bank stock, the only standard by which men are measured? Are there signs of thrift and industry, or do the looks of things indicate lack of enterprise on the part of the people?

The general appearance of farms and farmsteads in any community is a pretty true index to the lives of the people. It is also true that appearances have much to do with the actual values, as measured in dollars and cents. The well-improved, carefully kept farm loses in value when surrounded by other farms where the fences are poor, the fencerows weed-grown, the outbuildings old, and the farmhouses in need of paint.

In our best communities, in the neighborhoods that are real business assets, there has come about a big change on the part of the farmer. He is no longer willing to have his barn roof converted into a glaring billboard, or the sides of his buildings plastered with circus posters. He objects to having his fences or gates, or even the fine old trees in front of the farm, turned into free advertising agencies.

Profit Through Neighborhood Work

Wherever there is a neighborhood of named farms there is a community of thrifty farmers. There carelessness is giving place to care. There the people take pride in their business.

The farm name. How much better that the farm be named, and that its name be plainly and neatly displayed on mail box or front gate, than that the barn roof be covered with box-car letters advertising soap, tobacco, or other commodities for sale in the city. Somehow, when one sees a neighborhood in which the roofs of many barns are so painted, he comes to the conclusion that the farmers of that community are either too poor to paint their own buildings or that they are lacking in pride. If they must thus advertise, the commodities should be at least such as are produced on the farms of the neighborhood, rather than products offered for sale in the city. Is there profit in a farm name? Yes. First of all as a trademark; the consumer, when he finds the goods satisfactory, looks to see where the product came from and by whom it was packed. The next time he comes to buy, he looks for the name of the farm and of the community from which the product came.

FIG. 82. A good farm deserves a handsome, dignified, hospitable entrance.

Agricultural and horticultural displays made under the farm names, joined with the neighborhood name, constitute a valuable and attractive method of advertising. If, for instance, a farmer is working to build up a trade in country hams, somewhere on each ham, or on the package in which it is delivered, the farm name should be printed or stenciled. The country woman who has a few select city customers for butter can well afford to wrap each pound in oiled paper upon which is printed the farm name, together with the neighborhood name. The best country produce easily commands a premium which it is no trouble for the producer to get, if only he will make the consumer familiar with the name of the factory—that is, the farm and its location.

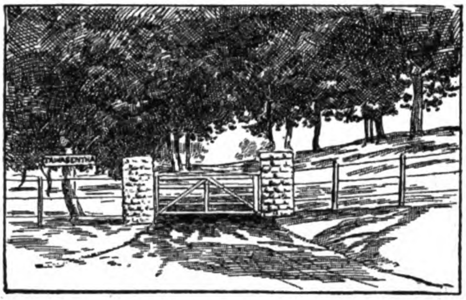


FIG. 83. The farm entrance—bearing the farm name—should be simple, dignified and in keeping with the place and its surroundings. The name of this farm would look better on a post than nailed to the tree.

Neighborhood names. What has been said as to farm names applies also to neighborhood names. It is worth while for a neighborhood to build a reputation for the quality of its products, whatever these may be, and to dispose of them under the community name. Some communities have capitalized the neighborhood name to such an extent that in cross-country travel we sometimes find it prominently displayed on the highway. In one instance stone markers have been erected on the main traveled road and at points generally accepted as the boundaries of the neighborhood. Another community has erected near its central point and over a well-kept highway, a large arch, featuring the neighborhood name. Where there is a neighborhood house or community hall—and happily these are becoming more common—there is no better site for giving prominence to the neighborhood name.

Great wealth is not necessary in the building of an attractive, inviting neighborhood. The big thing is for folks in the neighborhood to get together and work out their own problems. They must also understand that much depends upon each farmer working on his own farm and in his own way. The farmer who feels a real pride in his place is a community asset, and aids in making his neighborhood a desirable place in which to live.

Community pride. In a certain community in a western state, the people have, for a number of years, been working to make their neighborhood better and more beautiful. Everybody is proud of the neighborhood. This is shown in many ways. For instance, each buggy or automobile that goes to the city several miles distant bears a pennant showing the neighborhood name. Local pride, as seen in well-kept farm homes, has largely been responsible for a big advance in land values during the last 10 years. It should be borne in mind, however, that one farmer alone could have accomplished but little in such a movement. Big things are possible only where the members of the neighborhood join forces, where the people get together and work together.

A farm clean-up day. There is a close connection between community pride and cleanliness. This fact may cause a neighborhood to set aside a farm clean-up day. Once established, such a day becomes the centre of a community campaign for cleanliness.

On farm clean-up day, each farm in the neighborhood should be "combed and brushed," so to speak. The breeding places of flies should be destroyed and filth and refuse of all kinds removed, for flies and filth are the forerunners of fever. It will do but little good to "swat the fly," if the breeding places are left undisturbed; or to destroy a few mosquitoes and leave undrained the stagnant pool behind the barn. And these campaigns for health and cleanliness, if they are to do the most good, must be community movements. The mansion may be ever so sanitary, but it will help but little if in the tenant house or the home of a near neighbor dirt and filth are spreading diseases, or if the food and water supply of the neighborhood is such as to endanger health.

Coöperative buying and selling. As a selling unit, the neighborhood has many advantages over the individual farm. Principal among these is the possibility of a larger volume of business. The farm of average size is naturally limited in its output. For this reason, it is not profitable to advertise on a big scale. On the other hand, where the farmers of an entire neighborhood join together in the production and sale of a common product, it is possible to increase the volume so that advertising in a rather large way will pay. A saving can also be made in buying crates, boxes, barrels, or other material. Such neighborhood coöperation generally means the formation of an association, especially if the product is a perishable one, such as fruit, berries, or truck. This association, under proper management, guarantees the quality and grade of the goods.

"Boost your neighbor, boost your friend;
Boost the church that you attend;
Boost the farm on which you're dwelling;
Boost the goods that you are selling;
Boost the people around about you;
They *can* get along without you;
But success will quicker find them,
If they know you are behind them;
Boost for every forward movement;
Boost for every new improvement;
Boost the stranger and the neighbor;
Boost the man for whom you labor;
Cease to be a chronic knocker;
Cease to be a progress-blocker;
If you'd make your township better,
Boost it to the final letter.
Stop your knocking! Boost!"

In other words, it leads to the establishment of certain standards such as must be made the basis of all permanent and profitable selling.

There are, in the United States, thousands of places where both soil and climate are favorable for fruit growing, but where, because the neighborhood has not yet been developed, fruit growing is now unprofitable. With the coming of more inhabitants and the growth of the neighborhood idea, fruit growers' and shippers' associations will be formed, just as they have been wherever fruit is now profitably grown on an extensive scale.

Neighborhood work in seed growing and livestock breeding. The neighborhood makes possible and profitable the production and sale of purebred seed and registered livestock. One farmer cannot successfully grow a certain variety of corn if his near neighbor is growing another kind; for the result will be a mixture not fit for seed, but valuable only as a commercial product.

It was once a common belief on the part of many beginners in livestock breeding that it would be to their advantage to take up some breed of stock not before found on the farms of the neighborhood. This idea was a mistaken one. Community, or neighborhood breeding is best; for, in this, those interested in the same breed of stock work together rather than against one another. For instance, where the neighborhood is small, the farmers may profitably join in buying a sire of such worth and merit as an individual farmer or breeder could not afford to buy. In a larger neighborhood, the exchange of sires of known worth may prove a big advantage.

In the sale of surplus stock, the breeder who is located in a neighborhood where good animals are to be had in large numbers finds it much easier to make sales. Buyers are attracted to such a community. The farmer or breeder who is in the market for but one animal, goes there knowing that he can find what he wants without loss of time and money in looking over herds that are widely scattered. If, perchance, he should pay a little more for an animal of much better quality—and community breeding generally means better breeding—he has the satisfaction of knowing that he has invested his money in a good, registered animal rather than in railroad tickets and hotel bills. As to sales, however, the greatest advantage, perhaps, lies in the possibility of attracting the big buyer, the carlot purchaser, who from time to time will visit the neighborhood and buy practically all the surplus stock of the quality that he can use in filling his orders.

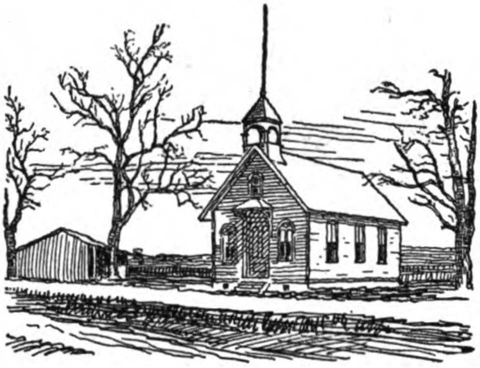


FIG. 84. Every neighborhood should have its meeting place. Many halls, such as this one in Burke township, Wisconsin, built originally for political or religious purposes, now unused, could be rededicated to such service.

Thus, measured by the commercial standard alone, the neighborhood has a decided advantage as a business asset. There are other and, perhaps, greater advantages.

Other Neighborhood Advantages

Good schools. A good neighborhood means good schools. For want of schools, for proper educational advantages for the children, men and women have often been slow to push out into new lands. Denied good schools for their children, fathers and mothers have left desirable country homes and moved to towns or cities, thus making the country poorer, often without making their own lives as rich and useful as they would have been in the country.

FIG. 85. The children of the neighborhood are both an asset and a responsibility. There should be playgrounds where they, too, can develop community spirit.

One of the first questions asked by the thoughtful man about to purchase a home in a rural community or neighborhood is, "What kind of schools has it?" Well may such a question be asked. What of the teacher? Is he capable, experienced, well paid? Are his ideals and viewpoints such as to make

FIG. 86. Such a school as this bespeaks a poor community, whereas—

for sane and real lives on the part of his pupils? Does he appreciate and praise the open country, or is he, day after day, shaping the lives of his pupils for careers in the city? Does he point out the opportunities in the country, or does he see in the growing things about him, in the animals of forest and field, nothing of interest, and in the country nothing worth while? Is the schoolhouse a plain, unpainted structure of "box-car" architecture? Or is this more-than-half-the-year home of the boys and girls of the community an attractive building, clean, comfortable, and inviting? What of the grounds? Is the playground weed-grown or covered with brush and refuse, or are there beautiful shade trees and shrubbery and inviting green grass, with room for the children to play? All these are vital neighborhood questions. They deal directly with the community's best crop—its children. In the schoolhouse and its surroundings we learn of the estimate which the neighborhood places upon itself. Always, too, we must remember that good schools do not come by accident, but represent the results of the best neighborhood sentiment put into action.

As communities progress, as better roads come, we find a growing demand for the rural high school and the consolidated district school. These are distinct neighborhood enterprises. They add to the value of farms, and stop one of the greatest sources of waste and expense, namely, that of sending country boys and girls to town for their education. The first expense in such a move, that of board and tuition, while heavy, is but a small one. The real expense comes in the loss of the boy and girl from the home community.

The church. Standing in close relationship with the country school is the country church. Practically all that has been said of the school in connection with the rural community is equally true of the country church. There are those who mourn the passing of the old-time church which was strong in creed, and which made for strong manhood and noble womanhood, but which gave little thought to community life as a whole. That church, which so ably served its people in its day and age—a day and age which are of the past—is perhaps not prospering as it once did. But in its place there is being developed a new church, in which there is not less of Christian spirit, but more of community interests. The people of such a church are no longer satisfied with a mere preacher, but want a resident pastor. This pastor, while none the less consecrated than were the pastors of other days, will be in closer touch with the people whom he serves. Naturally, this new rural church, with its larger vision and more complete service, will become the centre of community activities. A description of one such church is the story of many.

In a prosperous agricultural community in one of the leading corn-belt states is Harmony Church. This church serves the entire neighborhood. It is the centre of the life of all the community. The people of the congregation contribute liberally to every worthy cause. The church has a part in the important every-day life of the community. The pastor is more than a preacher; he is the community leader. The church has its young people's societies, its glee club, its orchestra, its baseball club, and even its trap-shooting contests—the latter using "clay pigeons," not live birds. Once each year there is held a great community home-coming, which has grown in numbers until as many as 3,000 people have gathered on the grounds at one time. Under the direction and leadership of the pastor, who, as has been said, is more than a preacher, the community has prospered as never before. Farms have been built up, residences and buildings have been improved, the entire community has become inviting in appearance, land values have greatly increased, and community breeding of livestock is being successfully carried on. Everywhere there are unmistakable signs of thrift and progress. In brief, this community is contributing to practically every cause except the courts. Not in five years has one of the citizens of this neighborhood been engaged in a lawsuit. The township is to-day without a local law-enforcing officer; it needs none. Incidentally, it may be said that the roads of this community are the best in the county.

One of the more recent projects of the Harmony community is the organization of the Harmony Shorthorn Breeders' Association. The 26 members of the organization—and to be eligible to membership in this special effort, one is required to live within 5 miles of

FIG. 87. A neat, roomy, well-kept school does more for its pupils, and also for its neighborhood

the church—have acquired 100 registered Shorthorns and 200 high-grade cows. Twelve registered bulls have been placed in service, although, as a matter of convenience, they are owned privately by a group of individuals within the circle.

This Shorthorn circle, which is but one of various interests which the community is encouraging, is a logical plan for the improvement of the cattle stock in the community. By this method prospective buyers are more readily attracted because they have larger numbers of one breed from which to make selections. The advertising and other expenses can be held to the minimum and at the same time the best of results can be assured.

This little church community is, therefore, even in this one respect, undertaking a very important and useful work. In too many communities do we find the stock representing a half dozen or more different breeds, the result being that coöperation is almost eliminated; the individual breeders must fight their own battles and, with only a few head of salable stock, they are at a disadvantage as regards attracting buyers. There is now a growing inclination to adopt one breed in a community and to adhere to that breed; the results are distinctly gratifying.

Roads. There is a close connection between good roads and agriculture. Without good roads the best work of school, church, or commercial body is not possible. We may build modern homes on the finest of farms; but, if to live in them means to be cut off from the world, even for a few months during the winter and early spring seasons, men and women will still turn to the crowded city. In the best country communities, the conclusion has been reached that good roads, good sense, and good business go together. While roads cost money, they make money. They may, for a little while, put a burden on the farmer's pocketbook, but they put a lasting value on his land. What is of greater importance, they create a healthy social life, and, by linking together the farm, the church, and the school, make for educational and religious uplift. In the building of roads the greatest good comes

FIG. 88. The roads are both the measure and the result of neighborhood spirit. Poor roads and poor homes go together—

FIG. 89. Whereas a good road is very likely to be bordered by good farms whose owners take pride in their surroundings.

through community or neighborhood effort. Good roads are likewise one of the greatest assets that any community can possess. They are more than connecting links between farms. They are the arteries through which flows the red lifeblood of the country, without which no town can long keep alive. Thus do good roads, connecting the country community and the nearby city, become of value to both the urban and the rural people.

Nothing, perhaps, could possibly add more to the attractiveness of life in the open country or subtract more from the common objections urged against it, than good roads. The community that is without good roads is without rural free delivery mail service, one of the greatest agencies in the betterment of farm life. The good road brings with it a feeling of comfort and safety. Should sudden sickness or an accident make it necessary to call a physician, the value of a good road leading to the farm home could not be measured in dollars.

The profitable marketing of crops demands good roads. The manufacturer seeking a location takes note of the railroads and other means of transportation. Because every farm is a factory and because most of the products of the farm must be moved to the consuming centres, the wise farmer thinks, first of all, of the wagon roads. The average cost of hauling farm products in the United States has been figured at 23 cents per ton mile, while on improved roads the cost is but 10 or 11 cents. With an average haul of 9 miles, and with a ton load, the actual saving on every trip over a good road is more than $2. The neighborhood that is connected with the market or shipping point by good roads has a big advantage over the one where the farmers have long mud hauls, or where loads must be drawn over steep hills. Neighborhood action, which alone makes good roads possible, represents practical benefits which may be measured in terms of dollars and cents.

Until communities have been developed, until neighborhoods have taken form, there can be no road building of a permanent character. The early settler traveled the trails, the pioneer put up with paths; but the farm-

FIG. 90. Good roads have a real cash value. Here the difference is as one bale to twelve. They have an equally striking and important effect on the moral and mental characters of the people who use them

er in the prosperous, progressive country neighborhood demands real roads.

The care of roads is largely a community undertaking. One form that road activity has taken is that of road dragging. In many rural neighborhoods, road-dragging clubs have been formed, and the entire road mileage is dragged after each heavy rain. Even in the absence of hard-surfaced highways, this makes possible the all-the-year-round road.

Other neighborhood movements. The neighborhood fair, picnic, and pageant are among the best of community activities. First of all, they get the people together, get them to working together, talking together, and thinking together. The result is coöperation not only in one particular project, but in many others in which the neighborhood is interested. The country community needs to be cemented. The people of the farms need to be brought closer together, so that they will the better know and understand each other. It is the half acquaintance, like the half truth, that hurts. A lack of understanding may breed suspicion. A good motto that has been suggested is, "Get acquainted with the other fellow; you might like him." Getting acquainted, then, means a strengthening of the community and makes possible real team work.

Fairs and other neighborhood activities. A fair, if it be clean, high-class, and of educational value, is a strong incentive toward agricultural betterment and community upbuilding. The neighborhood fair does more than call attention to the resources of the community. It develops united work and leadership. One reason why more communities do not develop leaders is, that they have no work demanding leadership.

Many country towns and villages have joined with the local community or neighborhood in conducting local agricultural fairs, and in this work the people of the farm and of the town have been brought into closer relationship. Neighborhoods growing special crops frequently hold feature fairs or picnics. These may take the form of local fruit exhibits, grain shows, "melon days," or "strawberry days." Such activities not only draw the people together, but are valuable advertising for the leading product of the community. Much along the same line, but distinctly educational in character, is the farmer's institute or agricultural short course, open to every neighborhood of progressive farmers.

Strength in coöperation. (See Chapter 6.) There is need of coöperation among farmers, and it is the development of the neighborhood spirit that makes possible this joining together of forces. Many men working together can accomplish a task that would be impossible for one man. "In union there is strength." The truth brought out in the old story of the bundle of sticks has not changed.

One farmer alone cannot successfully combat insect pests. No one farmer can rid the neighborhood of chinch bugs. It is practically useless for one farmer to put off wheat sowing until danger of the Hessian fly is past, if his neighbor's wheat is sown early in the season. Working alone, one man cannot bring about better schools in a neighborhood. One man dragging the public highways cannot keep the roads of a community in good condition. One man cannot make a partnership fence good by keeping up his honest half, if his neighbor fails. Good, strong rural churches require the support of more than one man or one family. One man who wants and is willing to pay for his share in a telephone line, cannot bring such an improvement to the community. There must be joint work on the part of the neighborhood before the poles can be set and the wires strung; the value of the plant increases according to the number of people it reaches. This same principle holds good in

many other phases of farm life. Insect pests and fungous diseases of the orchard will never be done away with except by community work.

In many parts of the country wolves prove a serious hindrance in sheep raising. This is due largely to the fact that pastures and open fields are brush-grown, thus affording protection for the wolves. For one man to clear the brush thickets will avail but little, but where all the farmers in the community join in a general clean-up, the wolves can be driven out.

Hog cholera annually causes a loss amounting to millions of dollars. One farmer may strictly observe the law as to the disposal of carcasses of dead hogs, and may use the best of sanitary measures, but no one farmer alone can conquer hog cholera. There is need of community coöperation. If the neighbor over the fence allows his hogs that have died of cholera to remain where they died, instead of burning the carcasses, the entire neighborhood is exposed.

As a result of the neighborhood spirit, we have coöperation in labor. Nor is this new. In the olden times there were barn-raisings, woodchoppings and other forms of agricultural activity. Men now join forces in harvesting and threshing, in filling silos, in putting up ice, and in much other work. We have beef clubs, ice clubs, lamb clubs, and similar organizations. Few communities are without their farmer-owned telephone lines. The value of farmers' mutual insurance has long been demonstrated.

One modern form that coöperation is taking is the purchase of heavy machinery, or of machinery that is but comparatively little used on the average farm. Farmers of a neighborhood now join in the purchase of a tractor, a stone crusher for grinding raw limestone, or a lime spreader. Cowpea hullers, threshing machines, and hay balers are frequently community- or company-owned, especially in districts where farms are not large. Such purchases usually result in considerable saving by the farmers and indicate good business.

City and country working together. Good business methods add to the value of every country community and especially so as regards the relationship existing between the town and its near-by trade territory. The town that is surrounded by farmers who are barely making a living will have in it merchants who are doing little or no better. So the town becomes vitally interested in the kind of agriculture that is being carried on in the country. The farmer who makes no money has no money to spend. It is, then, to the interest of the town to aid in the cause of a better and more profitable agriculture. Every farm should be looked upon as a factory, for such it is. It is worth while for the town to interest itself in the output of these factories, and to aid in the profitable sale of the surplus product. Loss on any farm in the rural community represents, to some extent at least, a loss to the near-by trading point.

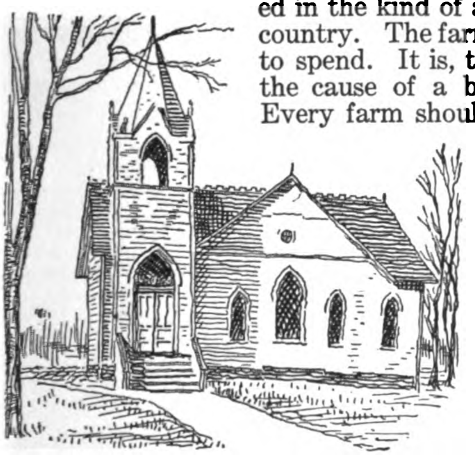


Fig. 91. Harmony Church (see p. 132), a center of religious activity around which a community has built a real neighborhood spirit of service and success.

So, the development of the rural community and the saving of the resources of the farm are questions of interest to city as well as to country. In making prosperous the farm, it is not enough that the farmer add to his bank account in the city. He must also, if the community is to continue prosper-

ous, add to that bank account which is represented in the increased fertility of his own farm. A neighborhood of soil robbers is not valuable as a business asset; commerce cannot long depend upon it. On the other hand, where progressive farmers join forces in business and in community upbuilding and betterment, the neighborhood becomes a source of great strength.

Through community or neighborhood effort, farmers are able to secure much that they want and need, and to make the neighborhood approximate what they would have it. Thus do they make it a real business asset.

What One Neighborhood Did

By MRS. GROVER PEYTON, *of Paris, Mo., who has seen, from a real country woman's point of view, what one farm community has done, and what others can do.*

One spring a family from Illinois moved into our neighborhood. The neighbors were slow about going to see them; in fact they were always slow about going to see newcomers. During the summer a daughter of this family returned from school and, soon after meeting many of the people, saw the need of something to bring them together more often. Then, too, she said she wanted to study agriculture, so she thought out a plan. She invited all the neighbors to come to her home on a Saturday night in September, when, after an enjoyable gathering we talked it over and decided to make a regular Saturday night affair of it and to call it a class for the study of agriculture. Thus was born the North Side Agricultural Class of Paris, Monroe County, Missouri.

At first our meetings were very informal, our programs consisting mainly of talks by one member, an agricultural college graduate. Whenever he was absent the program was lacking, and we soon saw that we must be organized and give each member a part in the work; therefore, a better organization was perfected.

The meetings were held in our new neighbor's big, roomy kitchen. It was soon proved that there is no better way to make all feel at ease and enjoy the meetings more than by gathering in the kitchen.

We began the study of agricultural subjects as the season brought them. For instance, in the fall we had good programs and lengthy discussions on wheat sowing, including the preparation of the soil, the treating of the seed, and the best time to sow. Then came corn judging and talks on the selection and care of seed corn, which created a new interest in its better selection and care. This interest has borne results; those who formerly selected their seed corn in the spring from the shock or the crib, now select it from the field before the snows in the autumn and care for it in the proper way during the winter. This brought up another subject for study, namely, the testing of seed corn.

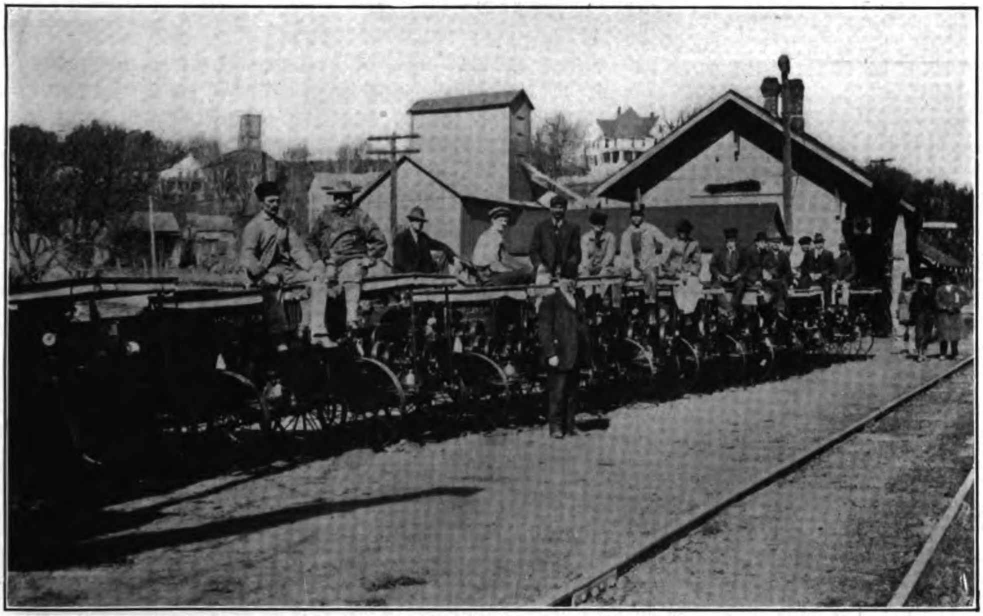
The winter months gave (and have continued to give) excellent opportunities for talks and the exchange of ideas regarding fertilizer and farm machinery; many of our evenings are spent in the discussion of livestock on the farm; and so the seasons bring new and ever-interesting ideas.

One year we decided, on a Saturday night, to make a display at our county fair on the following Tuesday. The time was short, but we made the display and won first premium and our success went a long way towards increasing the willingness and tendency of all the members to work in unison. Such work invariably creates a better feeling of friendship among its members.

The townspeople have helped by coming to our meetings and otherwise manifesting an interest in our work. We have had some good talks from our town friends on Coöperation, Gardening, Marketing Farm Produce, and Good Roads. Our former superintendent of county schools also was a great help to us, meeting with us as often as possible and loaning us books. One of our members has a collection of bugs and worms and is well informed as to the life and habits of such pests. Another is an expert at caponizing; due partly to his work, our neighborhood is now a leader in the production of capons which command high prices.

When summer, with its extra outdoor work, comes, there is not much time to prepare programs, so our summer night meetings are more of a get-together-and-talk-it-over kind. The problems which have come up during the week are discussed, and often a neighbor has a valuable suggestion to offer by means of which the next week's work is made easier.

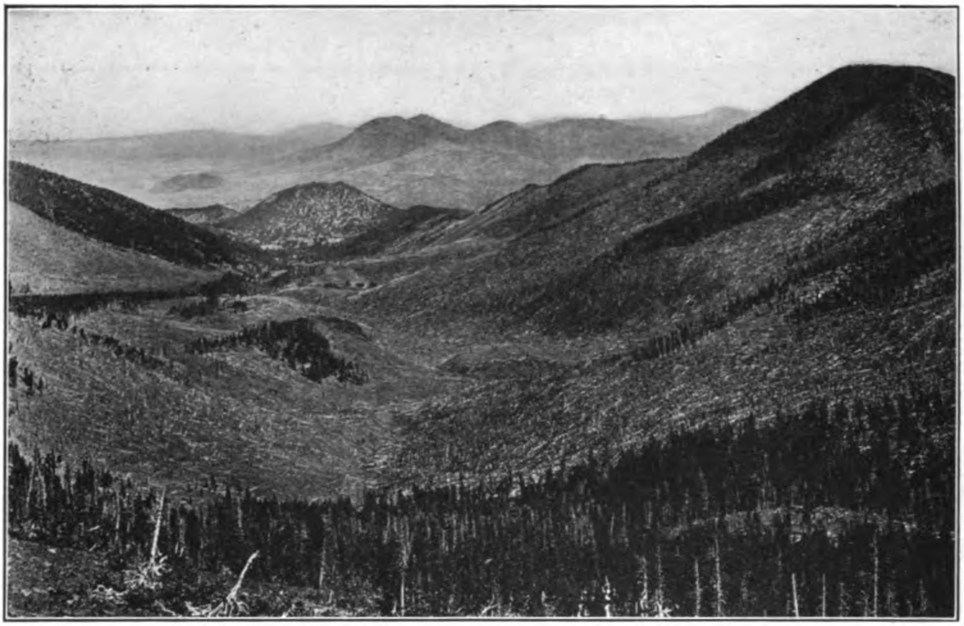
When, as a nation, we have these agricultural clubs, community clubs, or whatever you may name them, all over the country; when we have consolidated schools with plenty of room for these gatherings; and when we furnish amusement for our boys and girls as inviting as that in town;—then we will hold them close to the farms and the open country, and then we will have more progressive farmers.



A purchase of thirty power sprayers made by a coöperative fruit growers' association that saved the farmers who got them more than $1,000. (U. S. Bureau of Markets)

Shipping room in the $30,000 packing and storing plant of a Michigan coöperative fruit exchange that began when 25 farmer members subscribed $100 apiece. (American Coöperative Journal)

COÖPERATION IN FARMING IS GOOD WHEN APPLIED TO EITHER BUYING OR SELLING, BUT BETTER STILL WHEN DEVELOPED IN CONNECTION WITH BOTH



A forest devastated by fire. Our annual loss through such catastrophes is but one item in our national wastefulness—which is so largely unnecessary

A closer view. Not only is valuable timber destroyed, but also the power of the land to conserve water for future needs is greatly lessened

ONE OF THE CHIEF FUNCTIONS OF LAWS IS TO PROTECT THOSE RESOURCES WHICH THE PEOPLE THEMSELVES FAIL TO LOOK OUT FOR. (U. S. Forest Service)

FARM KNOWLEDGE

VOLUME IV—PART II

The Farm Home, Family, and Community

NO farm is a complete success until it has been made not only a profitable business enterprise, but also a healthful, enjoyable place in which to live. Judging by the great numbers of boys and girls who every year give up farm home surroundings for city life, a good many farms must be in this respect at least, only partially successful.

There are many possible reasons for this; but all of them can probably be grouped under one or another of a relatively small number of conditions. In the first place, the boy or girl may simply lack the necessary characteristics of the farmer or farm woman; this is a circumstance that in most cases cannot be changed. Secondly, farm work as done on the farm in question may be uninteresting, uninviting, unprofitable; a remedy for this is the adaptation of modern, scientific methods such as have been discussed in the preceding pages and the earlier volumes of this work. Next the farm home may be lacking in comforts, conveniences, and such other factors as make possible a normal, healthy, productive existence; means for improving such a condition are discussed in Volume III as well as chapters that follow. Again, parents or the family as a whole may withhold that sympathetic interest and encouragement that is essential to the most efficient performance of a task, especially when the performer is a child. The failure to provide means for getting an education or to encourage the desire for it constitutes another great drawback. And, finally, there is that large field of outside interests, the life and opportunities of the environment, the neighborhood; normal men and women, no less than children, must have companionship in both their work and their recreation. Consequently the farm that is out of touch with its neighbors, or whose neighbors are incapable of stimulating mental growth and development, struggles along under an almost insufferable burden.

The next six chapters deal with the above mentioned factors as they exist, but more especially as they can and should be developed. They represent to a large degree the domain of the farm woman; but as maximum results can be obtained from the farming business only when all the family is concerned, interested and employed, so the farm home can reach its highest plane only when all who live within it coöperate both to create and to enjoy its blessings. —EDITOR.

CHAPTER 10

The Farm Home

WHEN, half a century ago, the pioneers crossed . . . 'the prairies, as of old the pilgrims crossed the sea,' the sole possessions of the settler were his prairie schooner, a team of horses and a dog. The first act of the homesteader was to build a hut, a sod house or a dugout. To-day the fruits of his toil and his pain are evident on every hand. Not the least conspicuous of these fruits are the homes that he and his sons have builded upon the wide prairie stretches. Gone are the huts, the sod houses and the dugouts. In their places are frequently found thoroughly modern houses, rivaling in luxury and comfort the houses of city dwellers."

This condition, as pictured in the Twentieth Report of the Kansas State Board of Agriculture, is typical not only of the great prairie regions, but of the country as a whole—wherever man has ventured in subduing the wilderness and establishing civilization. Thus among the most enduring and most striking of the farmer's achievements must be counted not only his farming but also his home building. Not every farm home, even to-day, presents such "thoroughly modern" conditions, such "luxury and comfort" as are quoted above. But it is not too much to say that every farmhouse can, and should, be a real, pleasure-giving, comfort-sharing home, one to be proud of, to have affection for, to want always to come back to. In such a home the inside and the outside bear equal responsibility for the total effect. Each can be made to attract or to repel, to charm the eye or to torment it, to soothe the spirit or to keep it constantly in an unexplainable state of unrest and distress. This chapter suggests how the desired ends—the creation of beauty and homelikeness—can be attained, simply and at low expense by any farmer, anywhere.—EDITOR.

THE OUTSIDE OF THE FARMHOUSE

By RODMAN SCHAFF, *a practical New Hampshire farmer, whose farming means not only an attempt to make his business successful, but also a determination to make his farm a home, and his farm life a happy life. One way to bring about these results is to beautify the home surroundings with growing plants, trees and lawns. Mr. Schaff tells you, out of his own experience, how to do this effectively and at the same time simply. For directions as to the growing of ornamentals, see Vol. II, Chapter 30.*—EDITOR.

THERE is hardly anything that gives greater satisfaction than living in a house amid surroundings that are bright and cheerful. Nothing impresses the passer-by more favorably than a house which shows that the occupants love it enough to take care of it. All the members of every farmer's family owe it to themselves to make the spot they live in as beautiful as they can, especially since this may be done at small expense and with little trouble. A few well-placed shrubs, vines, trees, and flower beds, with a little well-kept lawn, not only add to the actual real estate value of a farm, but also make it a more beautiful and cheerful place in which to live.

The very best way to start is to spend half a day clearing up around the outside of the house, getting rid of the trash and rubbish that is sure to accumulate where indifference, carelessness and lack of system abide. In fact, this first drive is usually half of the battle. The other half comes in planning and planting; and except for a few flowers which are started from seed each year, much of the work, once done, is done for all time, some for a generation or two, and the rest for a decade at least.

Make the house the centre. In planning to improve and beautify the home surroundings, always make the dwelling house the centre, including with it any lower, attached buildings such as woodsheds, dairies, and outbuildings of one sort or another. Big barns, wagon-sheds, etc., if close to the home buildings, should be cut off by planting a row of quick-growing trees, such as poplars. These need not be very close together since they look and grow better if 20 or 30 feet apart, than if half that distance. The idea is to make a reservation of the house and some of the land immediately around it. In such planting, curved lines for short distances are generally most effective, or straight lines ending in slight curves. In planting the house grounds, try to have the house look as if it had grown up out of the ground, which can be done in many ways, depending somewhat on the general style of the house itself.

Use plants to soften the lines of the house. Houses with porches along the front or across one end are made most attractive by planting vines which can be trained to run up the posts and along the edge of the roof, so that they will furnish shade in the summer. Select those that are hardy in your locality, or that need at most only slight protection in winter. Rambler roses grow quickly, afford good shade, and when in bloom produce an effect of beauty and brilliance that it is hard to duplicate or excel. A flowering vine is better than one without blossoms, because of the pleasing contrast between the bloom and the foliage, except in shady situations where the flowers are apt to be less brilliant than usual. In such places broad-leaved vines without flowers do better and produce fully as good an effect.

At each corner of the house, a small group of 2 or 3 shrubs that will grow about as high as the piazza roof, set 4 to 6 feet from the building will break the straight line, and in time will probably mask the corner entirely. Straight lines are seldom found in nature, and we are trying to make the house look as though it grew up out of the ground.

If the house is only about 20 feet from the ground to the ridge pole, lay out narrow flower beds, 2 to 2½ feet wide, along the front or side, having a sunny exposure. The higher the building, the wider the beds should be, but in any case, keep them shorter than the full length of that side of the house and far enough from it so that the plants at the back will be just outside the roof drip, unless there is a wide overhanging roof to protect them all. Put the tall-growing flowers at the back of the bed and those like sweet alyssum, pansies, and other bedding plants in the front. In selecting the kinds of flowers to use, try to arrange so that there will be some in bloom all summer, and enough over so that some can be picked to fill vases in the house. Masses or clumps of one color, or different shades of one color, are better than general mixtures of reds, blues, and yellows scattered here and there. If you select perennials (those which come year after year from the same roots, as iris, phlox, larkspur, etc.) or biennials (which live 2 years and often seed themselves, as foxglove, hollyhocks, clovers, etc.) and protect them properly in winter, the expense is not great to start with and but little care is required after they are started. Nothing decorates the outside of a house better than a few bright flowers.

Houses without piazzas can be treated in much the same way, except that the shrubs placed at the corners should be higher-growing. If these become so tall that most of the foliage is at the top, and a good deal of wood growth near the ground is left exposed, one or two lower-growing shrubs should be set in front, or others of the same kind may be used and cut back frequently to keep them broad and bushy and supply a mass of foliage from the ground up.

The same general plan can be carried out

FIG. 92. Vines and shrubbery have, as well as the ability to beautify, a definite, useful purpose: namely, the masking of ugly views. Note how one season's growth can hide a bare, unattractive fence and unsightly rubbish heaps

FIG. 93. The run-down, cluttered-up, untidy yard not only is unpleasant for beholders, but also has a discouraging, demoralizing effect on the family that inhabits it.

with the flower beds some distance from the house as has been suggested for those close to it, except that it is better to use higher-growing flowers, such as hollyhocks, at the back of them.

Vines on either side of a doorway trained around and over it, help to set it off and produce an effect of cosiness and hospitality.

In all selections of plants, shrubs, and flowers, keep the colors harmonious in relation to the color of your house. That is, do not use too many with red blossoms if the house is yellow, nor too many with yellow blossoms if the house is red. Violent contrasts should always be avoided; or at least the contrasting shades should be separated by white blooms which look well with any color and make an effective showing in any flower bed.

The pergola. Much can be added to the looks of a place with very little trouble and practically no expense, by building a simple pergola or arborway along one of the paths leading from the house to another building, the well, or some definite objective point. At the foot of each post, set a vine or two of a kind that in time will cover the structure. Flowering sorts are to be preferred to fruiting vines, such as grapes, which usually make unsightly litter, though it is better to raise grapes on the pergola than not at all.

Trees. A few well-placed, shapely trees are necessary about every house, but too many are about as bad as none at all, for two reasons. First, health depends largely on the presence of sunlight, and no trees that keep the sunshine from any part of the house the year round, or from any one room all day long at any time of the year, should be allowed to remain. Second, it is very difficult to have a well-grassed lawn if the trees are so numerous as really to shade it.

Fruit trees, if given plenty of room and kept free of branches within 6 or 8 feet of the ground, make very pretty spots of color in both spring and fall, and provide an attractive harbor for birds. As far as color effect goes, red varieties of apples, cherries, plums, etc., are to be preferred to yellow or green varieties.

Many unsightly sheds and outbuildings can be covered successfully with either grape vines, ornamental sorts or even dwarf fruit trees if you can afford and care to spend the time and give the attention required in training, pruning and tying them.

The entrance. If the house is reached by a long driveway from the road, a row of trees on either side of the drive is very desirable. In setting them out allow plenty of room for them to spread at the top but choose those kinds that are not apt to throw out wide spreading branches at the bottom. It is a good idea to start with one or two along the highway itself, thus forming an approach to your place. If the drive curves and is not lighted, a clump of white birches (if adapted to the locality) at each turn will prove valuable landmarks or "buoys" on dark nights.

Windbreaks, if desired, should be about 100 feet away from the buildings, and such trees should be used as make heavy growth near the ground. If evergreens, such as cedar, pines, spruce, hemlock, etc., can be successfully grown, they are effective not only as a windbreak, but also, in snowy countries, as welcome masses of colour during the winter, and as an excellent background for the house.

The lawn. No matter what is done to beautify the home surroundings, much of the effort will appear to poor advantage unless a well-kept lawn, even though small, is added. It gives the finishing touch and rounds out all the planting as nothing else can. As to size, make it only as large as can be well taken care of; this means running a lawnmower over it at least once a week in the summer and sometimes oftener. To look its best, a lawn should be kept close cut; a small one well cared for does much more for the looks of the place than a large one neglected.

If possible, it should extend around two sides of the house, preferably the southern exposures, and where low-branching trees will not shade out the grass. If trees are kept trimmed up, little trouble will be met with in getting the sod to grow well right up to the trunks; the use of the lawnmower will also be made easier. The best sod is one in which there is a large percentage of ordinary white clover. In making a new lawn, buy a reliable lawn-seed mixture and add an equal amount of white clover to it. Prepare the ground well, manuring, plowing or spading, leveling and raking carefully; then sow the seed thickly, rake lightly, roll, and water well unless the weather is rainy. Start the lawnmower when the grass is about 2 inches high, but don't cut too close or too often until it is well established. If cut often enough so that it is never more than an inch and a half high, it is best to leave the clippings as a mulch. Heavy applications, in the early spring, of chicken

manure and wood ashes at least a week apart will keep it bright and green all summer.

In making over a piece of old sod-land into a lawn, spread a few loads of good loam over it to fill up the hollows, level carefully, and seed and care for as just described.

Paths. Unless they can be kept free from weeds—which means quite a little work—dirt paths leading up to the doorways had better be put right into grass. Sometimes flat stones or flagstones are set in the grass to mark the paths and save the sod. If used, they should be laid perfectly level with the ground so as not to interfere with the lawnmower. Brick paths are attractive and durable, but weeds often spring up through them; concrete walks are lasting, relatively inexpensive, easily made with ordinary farm labor, and are most easily kept in good condition winter and summer. For the sake of dry feet and freedom from mud carried into the house, all approaches should be concreted, paved, or at least covered with boards during the muddy seasons.

Fences along the highway, if within 50 to 75 feet of the house, and especially if painted white, should have some vines running over them, or a row of low, flowering shrubs planted along them for a short distance beyond the house grounds on either side. Even the unattractive (though economical) woven-wire fence can be made sightly by planting a honeysuckle or small-flowered clematis at each post.

THE INSIDE OF THE FARM HOME

By HELEN JOHNSON KEYES, *one of the editors of "The Farmer's Wife," and formerly editor of the Household Departments of "Farm and Fireside." A woman who, though not born on a farm, has found the source of her deepest interests and the field of her greatest endeavors among real farm conditions and practical farm people. She combines this sympathetic understanding and appreciation of farm needs and the farm point of view with a knowledge and a trained experience of how to recognize and bring about artistic results. She knows farm homes as they are; and she can describe them—as she does here—as they can and should be.*—EDITOR.

THE doorstep and entrance to the farmhouse cause us to form certain ideas as to the people who live there. Of course, some people are much better than their doorsteps. Some, too, are worse. In the main, though, we find that the spirit of the home greets us at the front door.

Porch and vestibule. A large front porch generally gives a pleasant welcome, but often it is not possible or best to have such a porch. In this case a pointed roof over the steps may provide protection from sun and storm, and two built-in benches with high backs, facing each other from either side, seem to invite the visitor to be seated till the door opens. The benches may have lids and serve as boxes in which to lay away overshoes and raincoats. In winter, the porch may be enclosed as a vestibule.

The Hall.

The hall speaks the next word of welcome. Whether it is spread out and made into a sort of room, or whether it is only a passageway, we like better to have it light and bright. Often there is little free space for windows and, for the sake of privacy, we like to keep our door solid or to curtain its opening. It is wise to paint or paper the hall walls a bright color. Pumpkin-colored walls with thin white window curtains, white or oak-colored paint, and a good brown floor are good. Or the walls may be a creamy-tan and the curtains a real sunshine-yellow. In this case it is necessary to have a shiny material like China silk for the curtains, in order to get the feeling of light. Many men like red. Although dark shades of this color take up the light and leave nothing of it for us, there is a bright shade, known to the painter as Pompeian red, which gives back into the room all that it gets, with a little added for good measure. This would be too glaring for a hall which is used to sit in, but would do for a passage. Although white paint is prettier with this red than oak-color, the latter is all right. The window curtains should be thin and white, and the floors brown. Whatever color we choose for walls, let it be plain, or

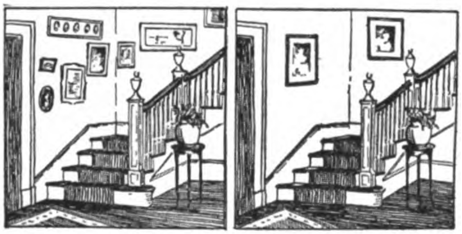


FIG. 94. A simple, attractive front hall showing how it can be spoilt (*left*) or made the most of (*right*) by an appropriate, artistic arrangement of pictures (see p. 147).

nearly so. If we like a design let it be indistinct and of the same color, though not of same shade as the background.

Stairs. Often the stairs are the first things to attract our attention. The stairway should be made up of steps that are broad rather than high. This means fewer backaches at the end of the day. Some may like a bright, well-padded stair carpet. Well may we forget for a moment the ever-present germ and remember what a protection this covering is both to the little feet and to the infirm ones which pass up and down. Frequently it is a necessary economy of heat to have the staircase closed. When this is so and the door is placed on the upper story, it has the advantage of cutting our falls short before they are begun instead of merely stopping us at the bottom of the stairway.

Hall colors. The color we choose for the hall will depend, of course, on the color we have, or plan to have, in the rooms which open out of it. It is not pleasant to pass from one color to another which does not "go" with it. It is true, however, that almost all colors will look well with one another if the right shades are used. The way to make red go with blue, for instance, is to mix some red in the blue, so that it becomes a red-blue. Then it "connects up" with the color with which you want to use it. And so on, with yellow and green, and green and violet, and all those primary colors we learned to name at school and which we see in rainbows. They are wonderful when they span our meadows, but they must be mixed in order to get along well in the house. Another way to bring about agreement between colors is to mix one of them with gray. Then it becomes what is called a neutral shade. Get the right shade by putting a little of the color of the one into the other or by graying one of them. We can then combine any colors we choose.

There is another fact to remember about colors: The greens, greys, blues, violets, and pinks are suited to sunny rooms; the reds, yellows, and golden-browns are for shady ones. The wheat-colored living room, therefore, needs the sun. If, on the other hand, it is a north room, get golden light into it with the colors autumn uses to make our countryside glorious when days shorten and the frosts nip. There they are, all the facts and all the suggestions for our rooms, written upon the ground and along the hillsides.

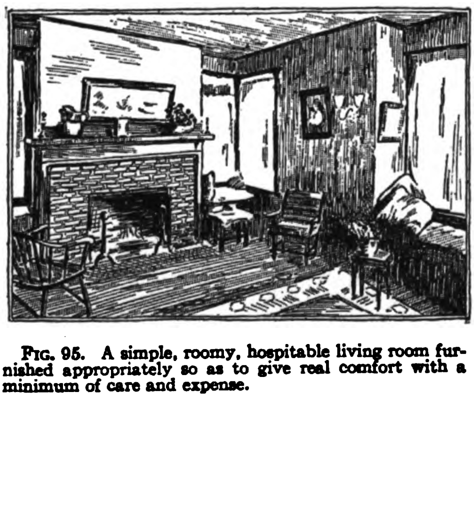


Fig. 95. A simple, roomy, hospitable living room furnished appropriately so as to give real comfort with a minimum of care and expense.

Floors. Here is another hint given us by nature: Outdoors we stand on dark brown earth; indoors let us stand on dark floors. A light-colored floor—unless the room is white and gold, good for a ballroom or a palace, not for a farmhouse—gives us a sense of flying, not standing. The floor should be the darkest tone in the room, the ceiling the lightest, and the walls a connecting tone. Speaking of ceilings, they are better calcimined than papered, but if paper is used, avoid a pattern. A papered ceiling may receive two coats of calcimine over the paper.

The Living Room

In the farmhouse of our fancy 3 generations gather. There must be the easy chair and the couch for grandfather and grandmother, and these are loveliest when they are drawn near a fireplace. At a well-lighted table father reads his farm journal and mother's busy fingers ply the thread in a piece of fancy work. The young people have a big table all their own, where they can play games, read their books and bulletins, or make their shirtwaists. There is a piano, too, or a self-player of some kind ready with sweet music. Such a room furnishes itself; that is, it is furnished in the best possible way—with family life. With tables which do not totter, lamps which do not go out for lack of oil, and chairs which tempt to a little laziness, every evening may be made complete.

As a matter of fact, however, we sometimes grow critical of the places where we spend our happiest hours. Perhaps it is because we love them that we want them as nearly perfect as possible.

Some evening, for instance, it may occur to us that the ceiling is too low and we wonder what we can do about it. Now, the human eye is very easily tricked, and many defects in our houses may be remedied, so far as appearances go, with but little trouble. The ceiling which looks too low may be made to look higher by the use of a striped paper, running straight up to the ceiling without a border. On the other hand, if it is too high, it may be "brought down" by dividing the walls into three horizontal bands. The lowest stripe may be a broad one of paint, about a third the height of the room; the second stripe may be of a paper with an indistinct design; the third stripe is the ceiling itself carried down the wall to meet the paper. If a door is too high for its width, a shelf at the

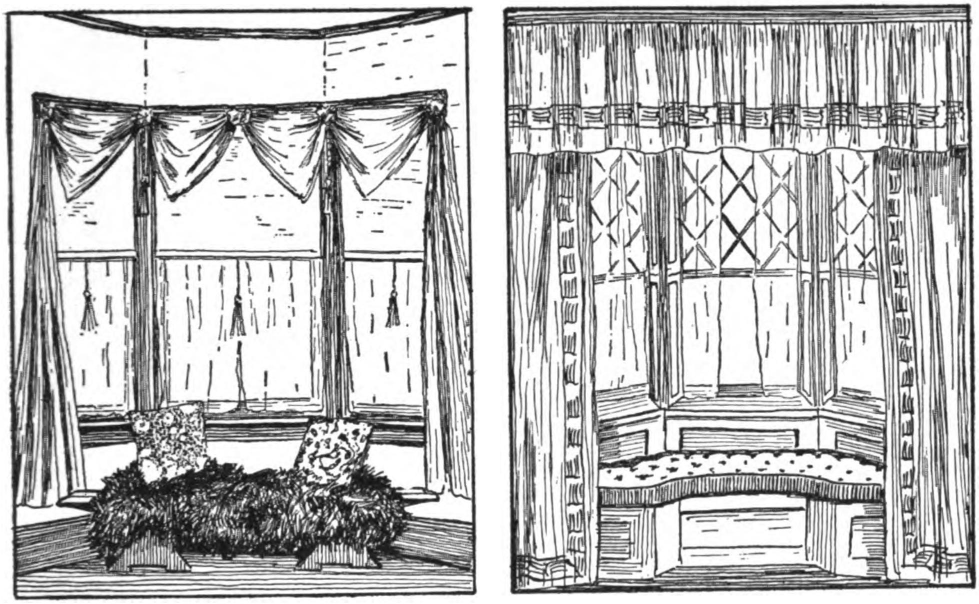


FIG. 96. A bay window seat showing poor taste (*left*) and good taste (*right*) in the choice and arrangement of draperies and fixtures

top will make it appear lower; and if it is too narrow it may be given breadth by placing flat against the wall on one side of it a couch or davenport and on the other a table of some size. Long, low book shelves will have the same effect. If there is a disagreeable feature about one part of the room which it is impossible to remedy or remove, attention may be drawn away from it if some very pretty or interesting article is placed opposite.

Draperies. A few draperies may give a room warmth and homelikeness, but there must be very few of them and none of the "stuffy" kind, such as woolens and plushes. Fringes, tassels, loopings, and festoonings should all be done away with. Chintz, cretonne, tapestry and denim do not take up dust so easily nor keep out so much light, so may be kept clean and cheerful. If the walls are plain, the draperies should have a design, but they must be plain where the walls are figured. Open spaces, clean paint, and well-dusted surfaces have great charm when left without drapery. This is especially true in a farmhouse where life is drawn directly from the bounties of earth, and not from the looms and shuttles of factories. No physician would hesitate to say: "Away with draperies," and the domestic-science teacher would certainly tell us to spare ourselves the labor of keeping them clean. Let us get the freedom of the fields, the big spaces, and the earthy, woodsy-looking things into our farm homes, and leave portières and hangings for the city house which has no such views as the country home affords.

Thin curtains at each window, however, are worth the trouble they cost by the way in which they trim and soften a room. The neatest way to hang them is from a rod which is run through a wide hem without a heading, and which rests on brackets almost at the top of the woodwork around the window. These curtains should fall straight down without tying, either to within half an inch of the floor or only to the bottom of the sash. The long curtains are more formal, but the short ones are often more becoming. Leave them drawn well aside from the window itself, so that the beauty of our acres will shine in. Lace is not a good material for farmhouse curtains. In its cheaper qualities it falls stiffly, softening neither the window-frames with its folds nor the light with its texture. If you can afford expensive curtains, pongee or China silk is most satisfactory. Among cheaper goods scrim is excellent, and cheese cloth falls in lovely folds.

Shades. Buy a good quality of roller shade. Nothing is more trying than shades which will not move or which rush up out of reach at a touch. The steel roller is better than the wooden one, and as it needs no tacks, it makes it easy to turn shades upside down when they are worn. The shade material should be adapted to hard wear. A shabby shade makes the whole room look shabby. In the south one often sees shades

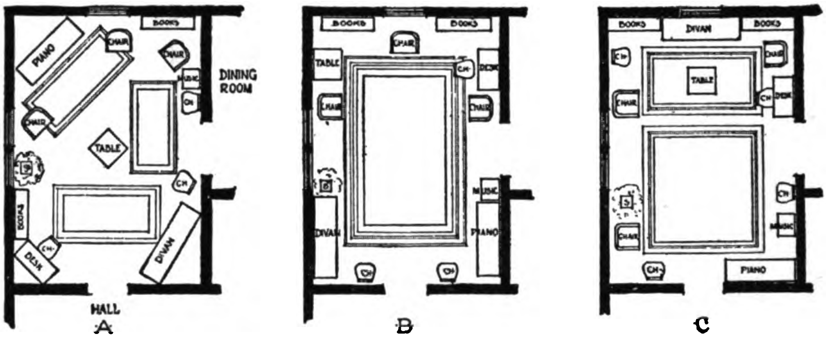


FIG. 97. Three possible ways to arrange the same furniture in a farmhouse living room. A tends somewhat to a cluttered-up effect because of the attempt to avoid straight lines; B approaches the other extreme; C practically provides two gathering centres in the one room. Personal preference and family habits must decide which style is the best to follow. (Cornell Reading Course.)

made of pretty chintz and the idea might well be used in other parts of the country. In a room with plain walls and no draperies they add a welcome decoration. If chintz is used for upholstery or cushions, it is well to have the shades match it.

Rugs. In our new standard of housekeeping many of us have come to prefer rugs to carpets. Old-fashioned rag rugs may be most attractive if the colors are well chosen and if woolen is not woven in with cotton. The fact that they may be washed in soap and water is a good recommendation. Many "art rugs" may be bought, but some of them wear poorly. There are on the market reliable Scotch ingrain rugs. They do not offer much variety of color and most of them are made with plain centres, but they cost but little, they wear well, and the dyes are lasting. An Indian rug is very rich and bright and well suited to a farmhouse. Wilton rugs are good in their designs and wear well, but the first cost is considerable. In regions where there is large game, fur rugs are very effective. Whatever we choose, let it be heavy enough to lie smoothly. If we are forced to use the slippery, wrinkly kinds, we may tack them lightly at the corners. Avoid designs that picture living things, roses and fat puppies. If we use a carpet we should not carry its edge to the wall but should leave a space of a foot or two so that a damp cloth may be used in cleaning the corners and cracks where dust gathers.

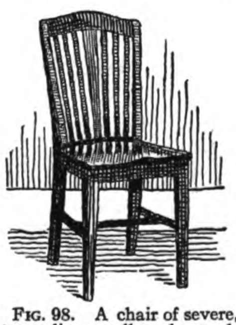


FIG. 98. A chair of severe, strong lines, well-made, good-looking and well suited to farmhouse needs.

Floors. We have said nothing about the timber for the floors themselves. Soft pine is the cheapest, quartered oak the best. Maple makes a light-colored floor which even oil does not darken. The floors of a busy farmhouse should be painted, oiled, or shellaced, not waxed or varnished, for the latter finishes will not withstand much going and coming. Either paint or oil may be kept bright by the use of a small amount of kerosene or milk in the cleaning water. Shellac is an excellent finish when home made or otherwise guaranteed pure. The yellow flake shellac may be bought at a druggist's and dissolved in wood or grain alcohol at the rate of 6 ounces to a pint. The shellac dissolves in about an hour. The mixture should then be strained through cheesecloth. In applying, work it with the grain of the wood and make the strokes long and slow. It has been estimated that in normal times the total cost of a soft pine floor laid and painted is 4 to 5 cents a square foot; that of a hard pine floor stained with 2 coats of shellac is 9 to 10 cents; and that of a quarter-sawed oak floor stained and filled with 3 coats of varnish, 19 to 20 cents. Straight oak with stain and 2 coats of varnish can be laid for 11 to 12 cents. In many cases the floor can be put down and well finished for less than it can be laid unfinished and receive a Brussels carpet or linoleum covering.

Furniture. There are farmhouses with attics where are stored heirlooms of what we call the Colonial period. Nothing better in furniture has been made and all these fine old things should be fixed up

FIG. 99. Although cheaper in materials, finish and appearance, and less serviceable, this type is often bought.

Fig. 100. Examples of simple, inexpensive yet varied and artistic pottery which is far more desirable and effective than useless bric-a-brac.

and worked over by the handy man or woman of the house.

The Mission style has become very popular. It is built on the principle of straight lines, so does not look well in a room with pieces of the curved-line, Colonial type. The only furniture which combines with it is large pieces of willow, of which the heavy, solid effect may be increased by brown or green paint, and which can be given a touch of color by means of bright cushions. One possible objection to Mission furniture is that it is apt to be too heavy. We like to move our chairs easily, even though they are solid enough to give us a feeling of safety when we sit in them. Willow furniture in a farmhouse brings outdoors in with it. It is durable yet light, may be painted any color to suit the room, and may be dressed with cushions. Chairs of solid, painted wood are always attractive. Morris chairs are homey and comfortable but costly. Sets and suites are no longer bought by the wise housewife.

Ornaments. Bric-a-brac harbors dirt and fails to make things look pretty. Flower vases should be merely holders for the bright blossoms and must attract little attention to themselves. If you have an open fireplace in the living room, put on the mantel above it a simple clock, if you have one, and one or two pottery jars in solid colors, without bold designs. The yellows, blues, and reds, copied from the potteries of ancient China, are usually good, even in cheap pieces. Pottery speaks of the earth and belongs in a farmhouse. Brass and copper are beautiful and should be used where their sunshiny faces will bring cheer. China and glass, except in qualities to please the millionaire, are generally poor in form, color, and ornament and merely litter a room. They become holders of burned matches and other little scraps which belong in the waste-basket. By all means let us have a good waste-basket, a durable, solid one which does not drop what has been put in it.

Pictures. Pictures require thought as to subject, framing, and hanging. We should never think of a picture as just something to put on our walls. Every picture should give us pleasure. There are pictures which please for an hour or so, but of which we grow tired if we look at them too long. In order to avoid this mistake, it is well to keep them near us for a time before going to the expense of framing. It is safer, too, to depend on the old painters, who have undergone the test of centuries and who are still loved and enjoyed. We can be pretty sure that we shall not tire of what they drew. Statues and great buildings are very fine in photographs, and their lines are so simple and bold that they stand out clearly from the wall in a companionable way. Useless wall-baskets, advertising calendars, or postcards should not be pinned up except in an office or a private room or bedroom the occupant of which knows that he or she likes them there.

Framing pictures. In framing pictures, the mat should be tinted to harmonize with the tone of the picture. In the case of a photograph this is either black, brown, or gray, although a gilt mat with a black frame is often very good. A gilt frame may also be used with a gilt mat. All mats should be narrow. The most attractive framing is often done without a mat, especially in the case of large pictures, when flat, square-cut frames set close to the photographs are very effective. Small pictures look well with a home-made "passe-partout" frame, that is, a strip of leather or strong paper glued like a binding to the edge of the glass and over the edge of a cardboard back which holds the photograph. Three large pictures decorate a room much better than a quantity of small ones. If the three subjects are similar—like three buildings, three statues, three madonnas, or three

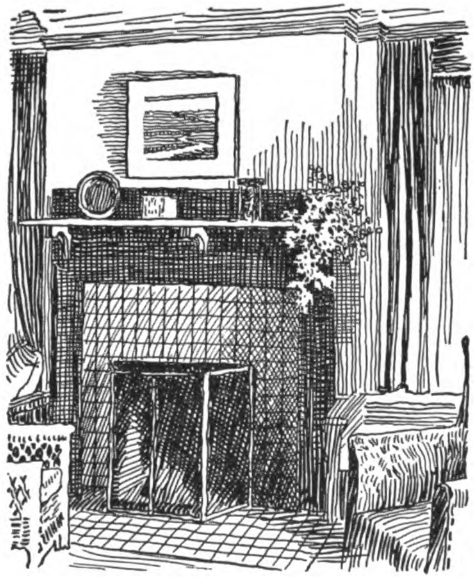


Fig. 101. A fireplace is more a thing of sentiment than of utility. It must, therefore, be attractive, appropriate to the house, and in every way a dispenser of comfort and good cheer.

FIG. 102. A fireplace and mantel in a room which is about everything it should not be. Note the "loud" carpet and wall paper, and the cheaply elaborate, gaudy bric-a-brac and furniture—ugly to look at and hard to keep clean.

Dutch farm scenes—they look well framed alike. If you have to use small pictures, group several together in one space instead of scattering them in a spotty fashion here and there.

Hanging pictures. In hanging pictures we may use: (1) a single wire which comes to a point over a picture-hook on a molding; (2) two wires, one going straight up from each side of the picture to two hooks on the molding; (3) a short wire hooked over a nail driven into the wall behind the picture. The latter method mars the wall, but if we are sure that we want the picture to hang always in that one place, no great harm is done and it is a gain not to have the ugly wire in view. If we use the molding, the double wire prevents the tipping of the picture after the lengths are accurately adjusted—but it is not always an easy matter to get the wires just the same length in the first place.

Books. Books in the country home should treat, very largely, of country things—of livestock and crops, of birds, flowers, grasses and insects. Of course, books of travel, history, and fiction, as well as the old standard works may have a place, but the farm interests should come first. Books add brightness to a room and, in a way, make it possible for us to know the owner. Many like books on open shelves. Glass doors protect them against dust, but if there are no doors, perhaps their use will be increased enough to protect them. In any case keep them in order, instead of allowing one to be on its side, another upside down, another pushed out of line, etc.

The fireplace. An open fireplace with wood logs, or with a coal grate, supplies cheer and beauty. There is nothing which will add more cosiness and enjoyment to a living room on winter evenings. A chimney faced with red bricks or large stones, according to the character of the region, is an ornament at every season.

Lighting. All of us would like to have electric lights because they are convenient, clean and bright. However, those who can not have them may take comfort in the fact that gas and coal-oil lamps afford softer light which may be better for the eyes. Whatever lighting we use, let us be sure that the rays fall on our work and over our left shoulder. We should not let the light come from both directions, nor should we face the burner. For this reason, side-lighting from brackets on the wall has great advantages over the central chandelier. Some movable lamps are needed. There may be one or two for tables with perhaps a tall piano lamp on the floor. Lamps are often ugly when it would be just as easy to have them pretty. A lamp which has a pottery bowl of solid color without decoration trims the table more than one of glass or nickleplate. China lamps decorated with flowers are not a good selection. The shades or globes on lamps and burners should be tinted to go well with the general color of the room. Green, ecru and rose-color are the prettiest. Any lighting which is said to be "just like daylight" is likely to be very trying unless well shaded; we do not sit down and read in strong sunlight.

The Parlor

If we are to have a parlor at all, it should show the same common sense furnishings as the living room. Its coloring may be more dainty and its arrangement stiffer, if that seem appropriate, but there is every reason why the room should not be dismal. Here, as elsewhere, the chairs should be strong enough to sustain weight comfortably. It is well to avoid fancy tables with strangely twisted legs, bumps, knobs, and pockets that collect dust.

Let us keep the window shades half-way to the top. Cheerfulness is always better than gloom. Pictures should be well chosen. Upholstery and draperies, if used, are best if light in color and dust-shedding in texture.

Why not a play room or office instead? But, after all, why not turn the parlor into a playroom for the children? Then there will be no picking up of the living room to make it orderly for the evening. Or, the parlor may be changed into a library with books, papers, music and games for all the family.

Here, too, perhaps, may be the farmer's office where he can attend to his bookkeeping and correspondence at a comfortable desk, and see his business callers. However, where there are grown daughters in the family, it must not be forgotten that they will want some attractive place to entertain their friends. In some farmhouses the parlor and living room are really one room separated by sliding doors which may be closed as desired.

The Dining Room

Whether it is wiser to combine dining room and kitchen or to keep them separate, must be decided by each family. The important thing is to decrease labor and increase comfort. The combination means fewer steps taken at meal times. On the other hand, the dining-room portion of the kitchen is harder to keep clean and orderly than is the separate room. Moreover, many housewives find added rest in the meals eaten out of sight of their workshops.

If separate rooms are wanted there should be between them a door swinging both ways. A table beside this door on the kitchen side and another near it on the dining room side will help in the service of meals. The dining table should be firm on its legs and such that it can be made larger when more room is needed. The chairs should match one another. Instead of buying a sideboard, cut a window between the dining room and kitchen at the right height for passing dishes back and forth. From its base run a broad shelf, set out half an inch from the wall so that no dust will collect along the back. This shelf may run the length of one wall or it may turn a corner, thus occupying a portion of two walls, according to the position of the window. On it keep the dishes which are in daily use. The idea may be made more complete by adding shelves below or above and by having closed cupboards at the base for occasional dishes and for left-overs which do not need the cold of cellar or ice-box. Set out the cupboard shelves half an inch from the wall to match the upper ones.

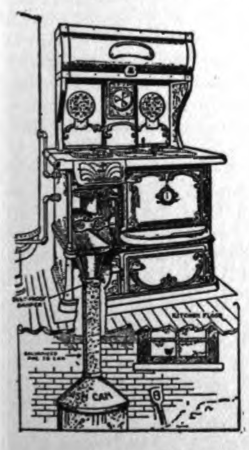


FIG. 103. An ash hopper connecting the range with a barrel in the cellar, saves work and helps keep the kitchen clean.

Where there are young children, or much hired help, or both, neither carpet nor rug should cover the floor. Painted, oiled or shellaced boards, or linoleum may be used and kept thoroughly clean. Oil-painted or flat-finished walls are better than paper on account of the ease with which they are wiped down with soap and water.

FIG. 104. The farm family has but little time to read. Its books and the surroundings amid which to read them should, therefore, be of the best. This is an enviable library corner in a real farmhouse.

Oil paints give a warmer and more lustrous surface, but the less expensive wall finishes are also satisfactory. When the plaster is left rough, the effect is better because it is less tiresome. The color should be chosen with the same thoughts which helped us to decide in regard to the living room. Plate-rails are not to be recommended. Dust gathers upon them and they are too high to be cleaned without special effort.

The Kitchen

The secrets of a good kitchen are: (1) to group together in handy places utensils which are used at about the same time; (2) to have range, sink, and tables of convenient height; (3) to get rid of water and dust-collecting cracks; (4) to have good light; and (5) of first importance, plenty of running water.

Walls and floors. The walls should be

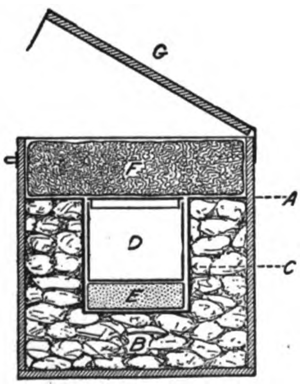


FIG. 105. Section of a homemade fireless cooker. A, outer wooden box; B, crumpled newspaper or other insulating material; C, metal container; D, cooking vessel with cover; E, soapstone; F, insulating cushion; G, wooden, hinged, tight-fitting cover with hasp.

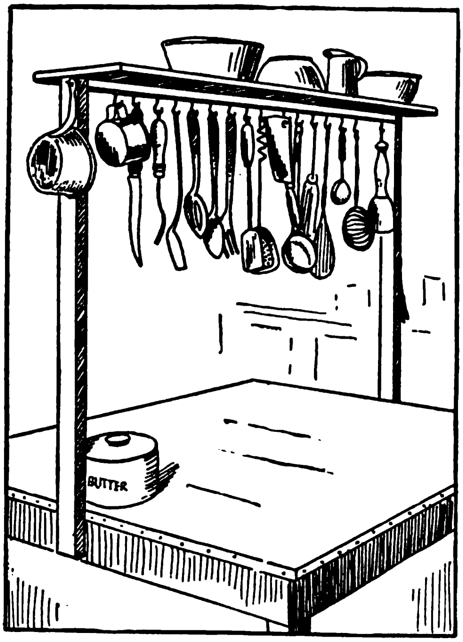


FIG. 106. Kitchen work table with device for holding cooking vessels and utensils, enabling it to be conveniently placed in the center of the kitchen.

painted a cheerful color. The pleasant pale shades of green, blue, gray, yellow, and pink do not suffer from washing, so that there is no excuse for using muddy, dark colors. The floor should have no carpet, but its boards, in order to be sanitary, should be tight and well-painted. If we use linoleum, the pattern ought to be bright and attractive. It should be laid in one width, and, instead of ending at the baseboard, should run up against the wall for a few inches over a rounded bar of wood. A three-cornered piece may be clipped out of the top at each corner of the room to get rid of the fullness. This is a sanitary covering and can be freely mopped without fear that water will trickle underneath it and form a dirty layer where germs will grow rapidly. Something pleasant to see from the windows is a help all day. If nature has not provided it, we can plant flowers within sight to cheer us for half of the year, and through the winter we can have window-boxes (Vol. II p. 426). Doors which permit a view into the living room or into other pleasant corners of the house, often stimulate us to fresh thoughts.

The range is almost the centre of the health and happiness of the family. If possible, let it be a good one, costing between $50 and $85, according to the amount and kind of cooking to be done. If we are in the natural-gas belt, we shall find the high ovens with glass doors worth paying for. They save many stoops, and burned fingers. On any kind of a range a thermometer attachment secures even the experienced cook against many half-failures. If the stove is too low, it may be raised on blocks. Then, there ought to be the fireless cooker—a homemade one if not possible to buy one.

Cupboards with shelves set half an inch from the wall serve for utensils seldom used. The heaviest kettles are placed low so as to save lifting. The utensils, spices, flavorings, tea, coffee and other things which we use constantly should be on hooks, racks, and open shelves above the working table near the window opening into the dining-room and on the left of the sink. The work table should be covered with oilcloth or zinc. Brass hooks set lengthwise in two wooden strips, which are as far apart widthwise as the length of the handle of a mixing spoon, make an excellent rack for tools which have no hanging holes. A good-sized lamp should be on a swinging wall-bracket at the left of this work table, with a similar one at the left of the sink. These shelves and racks are a homemade substitute for the kitchen cabinet which may be bought for from $15 to $30.

Bins for flours, cereals, sugar and grains, can be built against the wall opposite the range. An extra table with a good drawer is a convenience.

We have now disposed of the space along two and a half walls, or at least a portion of those walls. That leaves the space on the right of the range and along the wall at right angles to it free for the grouping of laundry utensils. There should be a shelf for irons, wax, bluing, starch, oxalic acid, and all the other necessaries and helps. There are ironing tables steady enough to rely on, which may be folded against the wall when not in use. Where the weekly washing has to be done in the kitchen, room must be left for tubs and wringer.

Ventilation. In every kitchen there should be opposite windows for cross-ventilation. If not, odors will creep into every corner of the house. One window should be kept open at the top, so that the foul air may escape; the other at the bottom, so that the good air will come in. When cooking is going on there should be an opening through which the heated upper air may escape.

The milk room. A separate milk room is a sanitary and convenient bit of building. It should have many windows, some of which are on the purifying south side. The cement floor should slant down at one end or towards the centre and connect with a drain leaving no cracks. Nothing should stand on the floor where it will be in the way of the washing process. Separator, butter-worker, and churn can be hung from the ceiling. A large tank for running water will keep

cold the milk and cream cans and the water-tight butter boxes.

The cellar. The cellar or basement should extend under the entire house, to keep out moisture and wind. Walls and floor should be of cement. Large windows placed opposite each other are necessary for the cross ventilation which ought to be provided day and night at all times except in the most severe weather.

It is not safe to store large quantities of vegetables in the cellar, as they will rot, but a supply may be stored in a room built for the purpose at one end of the cellar. Its tight partitions should be plastered on wire lathing. The ceiling should be treated in the same way. Half of the window should be darkened by dark green baize, and the other half of it fitted with a wooden, air-tight ventilating shaft which goes up outside, roof-high. Vegetables for storage here should be packed in barrels of sand.

If it is not possible to do this amount of building and repair work, we may look after the health of the family by providing good cross ventilation in our cellars, sanding the floors several inches deep, and whitewashing the walls with lime.

The bathroom. If we cannot have a complete bathroom all at once, let us build it gradually. A room near the kitchen can perhaps be set aside and furnished with a tub of enamelled iron, costing about $30. This may empty into a hopper filled with creosote preservative the contents flowing out through a tile drain. A tank for heating water may be placed above the tub, which it will fill with a faucet; or the hot water may be brought in buckets from the kitchen stove. A stove should keep the room warm during the cold season. Unless the place is comfortable and the arrangements convenient we are not likely to bathe as often as we should. When a complete water system with first-class plumbing can be afforded, there are great advantages in having the bathroom on the second floor, where it is more private.

The Bedrooms

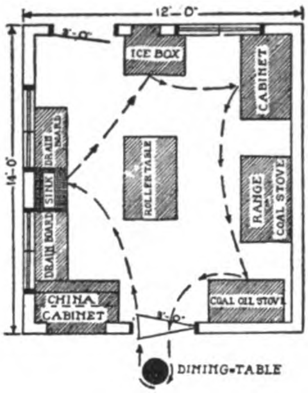
So far as is possible, each member of the household should have his or her own room.

FIG. 107. An outdoor sleeping room, protected against storms but freely open to the air, is one of the best of the modern developments in country house arrangement.

This arrangement makes for health and happiness. The habit of sleeping first in one bed and then in another and of having clothes strewn around in various rooms, destroys decency and neatness. Beds left unmade till night, and perhaps slept in again without making, start boys and girls along the paths of slovenliness. Children should be trained to open their beds wide, to throw the covers back, when they go to breakfast.

The habit of sleeping out of doors or on porches in all but the most severe weather is a good one. Of course, each sleeping room must have its bed for stormy nights and illness. These should be placed, if possible, out of sight of the door when it is opened. Place the bureau where a good light from a window by day and from an artificial light after dark falls upon the mirror. The washstand should be furnished with a white toilet set or else with one which is open stock, that is, whose pieces can be replaced at any time without varying the pattern. None of us likes bowls and pitchers, mugs and soap dishes which do not match. A screen placed before the washstand is a convenient bit of furnishing. It can be made at home of two wooden frames hinged together in two places and braced through the middle by bars of wood. When burlap is nailed on such a frame with brass-headed tacks, the appearance is excellent. One or two washable rugs, two comfortable chairs and a table are all the other furniture needed.

Simplicity should be the watchword in furnishing our farmhouses—simplicity and things in keeping with the lives we lead. Simplicity does not mean that we do not care for beauty or that we are satisfied with ugly things. On the contrary, without careful planning we shall not have good homes, and without good homes we cannot send efficient young people out into the world. But we should find our ideas, not in city fabrics and customs, but in the materials and habits of our own communities. Thus our farm homes must show their wood and stone, must have light and space, color and breadth. Their arrangement must be suitable to the hard labor which keeps them up, but there must be play corners, too, so that our Jacks and Jills shall not grow up as dull boys and girls.



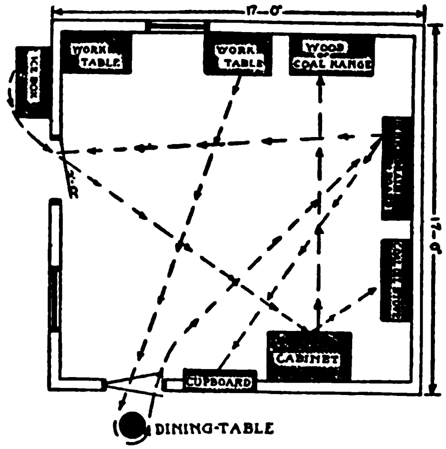


Fig. 108. A compact, well-arranged kitchen (*left*) and the opposite (*right*), showing how careful planning reduces the steps required in preparing and serving meals. A large kitchen is not necessarily a poor one, but a poorly arranged one of whatever size is a constant trial.

Practical Suggestions for Home Planning

By Bab Bell *(see p. 181), with suggestions contributed by* Mrs. H. A. Jewett, *of Missouri, a farm woman who has studied her housekeeping problems and worked out ways of solving them.*

DURING the last few years, the farm home has been the subject of much discussion. Many people seem to think that the farm home can not and should not be as beautiful or as expensive as the city home. Often we hear the remark, "But that house is too expensive for the country," or "Those plans can not be used in the country; such a house would cost too much." Is it not true that modern homes cost money, whether they are built in the city or in the country? Are not country people, as much as city people, entitled to beautiful and modern homes? Should conveniences, such as light, heat, and water, be classed as luxuries, when in reality they are necessities? Anything which brings more comfort, better health and greater happiness should be classed as a necessity, not as a luxury. It is very hard for many country people to believe that light, heat and water systems can be installed in the country as successfully as in the city. One reason for this is that it is perhaps more difficult to find experienced plumbers in the country. Yet if these problems are given painstaking thought and study by those planning to build the home, and if careful supervision is exercised, satisfactory work should follow.

What One Woman Did

Mrs. H. A. Jewett, a Missouri farm woman who lives in a conveniently arranged house which she herself planned, says, "The first thing to be considered in the building of a farmhouse is the saving of steps. Next to labor-saving machinery, is labor-saving planning. Above all, the farmhouse should be livable, for it is to a very large extent the farm woman's world. On the farm, if we grow lonesome, we cannot run down the street for a minute to greet a neighbor. So in the house and out of doors, we must find rest and pleasure. Let there, then, be plenty of windows—big windows and set low down—so that the tired farm woman, resting for a little while in her favorite low chair, can still catch sight of the pastures, hills and valleys with their flocks and herds. Always, in the planning of the house, pro-

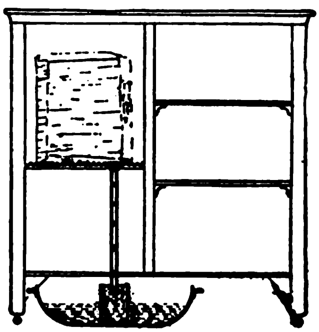


Fig. 109. Section of icebox showing water trap to prevent the entrance of warm air and the waste of the ice. If the pan can overflow into a drain, saving the trouble of emptying it, so much the better.

vision should be made for at least one window looking out upon the most beautiful view that the farm affords.

"Inside, the house should be attractive, but no room should be too good to use. The living room, with a cheerful fireplace, and the dining room—the two common meeting places of the farm family—should be as inviting as they can be made. Bedrooms should be so arranged as to provide for plenty of light and air. For the farmer to spend his days in the open will do little in the way of insuring good health if at night he sleeps in a small, stuffy room into which the sun never shines. Of course, every bedroom should have a big closet. On the farm, the men folks have to have many kinds of clothes, including overalls, work shirts and heavy shoes, and they need room to put all these away—to sometimes get them out of sight.

"No farmhouse is complete without an attic—reached by means of real stairs not a ladder or a narrow winding stairway. It should be well lighted. On the farm, there are many uses in addition to the ordinary ones, to which an attic may be put. Here, in the fall of the year, the man of the house stores his seed corn where it dries out and where it is safe from rats and mice. Here, too, the nuts are spread on the floor, while from the rafters hang peppers and, perhaps, bags of dried fruit."

The ideal home should be planned to meet the needs of the individual family for which it is intended. It should be convenient, economical, and beautiful.

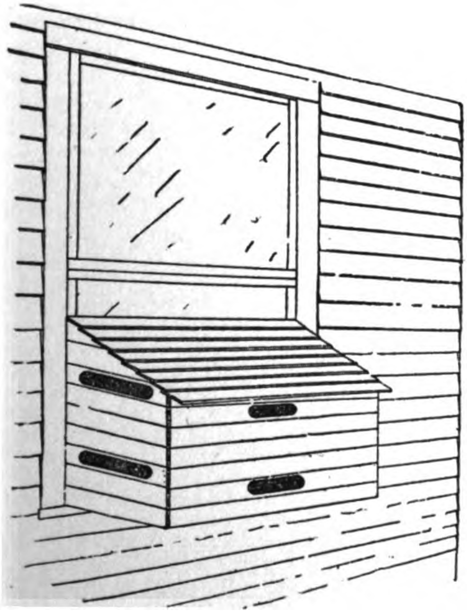


FIG. 110. An outside window refrigerator—except in hot and the coldest weather—is a saver of many trips to cellar or ice chest. Of course it must be screened.

FIG. 111. Most tables and sinks are not the right height for their users who are caused unnecessary effort, discomfort and actual physical injury by constant stooping. Note the effect of the added three inches.

The kitchen. The kitchen is perhaps the most important room in the house, yet it is the one most often neglected. The average homemaker gives little or no attention to the kitchen until it is too late. After she has been keeping house for a year or so, she realizes how important it is that this room, of all others, should be well planned. Much of the kitchen work which seems to be drudgery is really due to inconvenient and gloomy surroundings. The convenient arrangement of the kitchen is more important than its size. It is well for the housewife to consider the arrangement of her kitchen equipment from the standpoint of convenience, and to decide whether or not a rearrangement would save her time and steps.

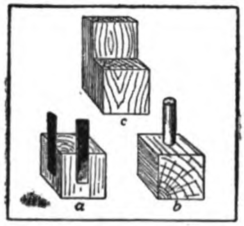


FIG. 112. Three ways to make a table the right height. *a* and *c* nail or screw to the legs; *b* is inserted in a hole bored therein.

Few kitchens are so perfect that there is no room for improvement, and no kitchen is so hopeless that it cannot be made more convenient by careful planning. Some kitchens need a wholesale changing of doors and windows for better light and ventilation; others need only a slight rearrangement of table, sink and stove to make a better working center.

Note the plans of two types of kitchens in Figure 108. That of the smaller, at the left, shows how steps are saved by carefully arranging the equipment. Important features are the sink and china-closet close to the dining room door, and the refrigerator within easy reaching distance of the cabinet, where the greater part of the meal will be prepared. The roller table forms a connecting link between the stove and the sink. If desired, a small service table may take the place of the roller table, and will be useful both in setting and in clearing the dining table.

Fig. 113. A desirable, non-dust-catching type of base- or mop-board.

The sink is so placed as to get ample light from high windows. There is a drain board on each side and under this are built convenient cupboards or drawers. The china-closet is placed on the right of the sink, because of the northwest exposure of the kitchen, but with a northeast exposure, the closet would occupy its natural place on the left. Many women hesitate to place the refrigerator in the kitchen for fear that it will require so much more ice. A well-insulated refrigerator should keep ice with no reference to outside temperature if the door is not opened too frequently.

Mrs. Jewett, quoted above, says on this subject, "In planning our new home it so happened that getting food to the ice box and from the ice box to the table with the fewest steps was the first thing of which I thought. This may have been due to the fact that in the old house the dining table and the ice box were a long way apart. In our present home the ice box is in the pantry, which has direct connection with both kitchen and dining room, while an outside door opening on a concrete porch makes it easy for the men when the box is to be filled with ice. A dumbwaiter between dining room and pantry does away with any carrying of food around through the kitchen. In winter, too, when ice is not used, the pantry is kept cool by means of an outside window which is regulated at will. Another feature of the pantry, which, of course, is screened, is a screened-in shelf-rack in addition. Do the best we can on the farm, flies will sometimes get into the house. When the ice box is being filled, is apt to be one of these times. It may also be the housewife's busy day, when she has not time to 'shoo' flies. Then it is that the extra screened-in quarter in which are placed warm bread, pies or cakes, and other food not ready to go into the ice box, comes handy."

Sink, table and stoves should be high enough (averaging 32 inches) to eliminate stooping and prevent resulting tired backs.

Fig. 115. A built-in, white-enameled kitchen cabinet. Note excellent lighting, stool; and glass doors which keep everything clean but always in sight.

The plan of the larger kitchen (Fig. 108)—which is not necessarily bad because it is large —shows only too clearly how much time and how many steps are wasted in a poorly arranged room. Of the farm kitchen Mrs. Jewett says, "It needs to be a sort of adjustable room, small enough to save steps on ordinary days, yet big enough to serve on the 'red letter days' of the farm, when, with threshing or silo filling, there may be 15 or 20 men to cook for. We met this need by having the kitchen rather long and narrow, with range and other things in daily use in the end nearest the doors to dining room and pantry. In this way everything is just as conveniently in reach as would be the case in a much smaller kitchen, while on the big days, more of the work is done in the end of the room near the outer door opening on to a big concrete porch. This spare room in the kitchen we also find valuable when we care to iron there rather than in the basement, or when canning or doing any other work requiring additional room."

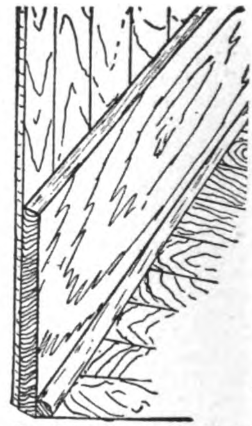
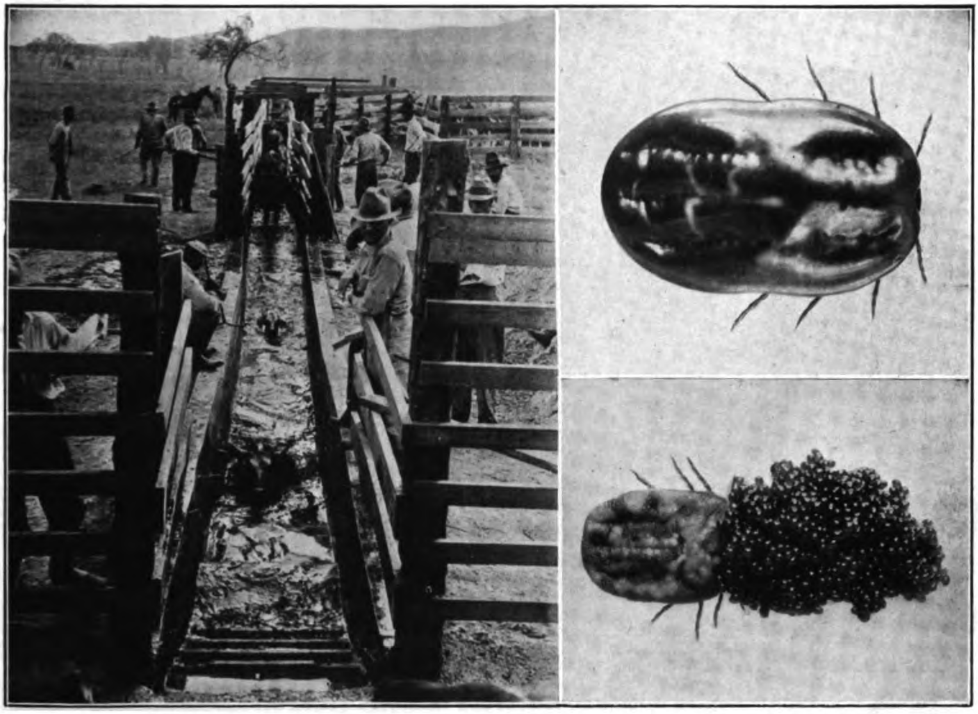


Fig. 114. The usual type of base-board that quickly collects dust and is bothersome to clean.

The stove is always a necessary investment. The steel range is the ideal stove where wood or coal is used. Its price varies from \$45 to \$85. Ordinary cook stoves cost from \$10 to \$35, but are poor substitutes for ranges, many of which have high ovens which save backaches. A range should be provided with a hood or canopy to carry off odors of cooking.

In the last few years kitchen cabinets have become quite common. They are a great aid in large, poorly arranged kitchens, since they keep most of the working materials at hand in one place. There are many good cabinets on the market, at prices ranging from \$10 to \$45. Arrangements should also be made for a pantry window-box in which food can be kept cold during many months of the year without the use of ice. It should be well made and painted the same color as the house.



Farmers have been saved millions of dollars by being taught to keep their cattle free from the Texas fever tick. *At left*, a dipping vat for this purpose; *at right* (enlarged) an adult female tick engorged ready for laying, and (*below*) laying eggs. (U. S. Bureau of Animal Industry)

The National forests, controlled and maintained by the Government, furnish pasturage for about twenty-five per cent of all the sheep in the western range country. (U. S. Forest Service)

THE FARMER HAS NO GREATER FRIEND THAN THE DEPARTMENT OF AGRICULTURE WITH ITS MYRIAD ACTIVITIES AND AGENCIES OF SERVICE

How the farmer traveled when he began the conquest of the virgin soils of the New World—

And how he travels now that he has learned to take and use their riches without robbing them of their fertility

THE FARMER'S AUTOMOBILE IS A SIGN, NOT OF EXTRAVAGANCE, BUT OF THE WISE USE OF MODERN MEANS FOR INCREASING HIS EFFICIENCY BOTH IN WORK AND IN PLAY

CHAPTER 11

The Farm Family

By MRS. HELEN JOHNSON KEYES, RUTH M. BOYLE and MR. W. L. NELSON (*see Chapter 9*). *Mrs. Keyes' interests and efforts have long centered around the broader, fuller development of the farm home—meaning, not only the house and its environment, but also the human beings who live in it. The discussion of this subject, like the solution of many of its problems, as she points out, requires mutual sympathy and understanding. For her part, Mrs. Keyes is well supplied with both.* MISS BOYLE, *who contributes the discussion on hired help in the home, was born on a Western ranch and has lived the greater part of her life in the Far West where she has gained a practical knowledge of the farm woman's difficulties as well as her opportunities. She taught in a Montana rural school for 2 years, graduated from the University of Wisconsin, having specialized in journalism and rural sociology, and shortly afterwards became household editor of "Farm and Fireside."* MR. NELSON *writes, with intimate knowledge, on some phases of the hired man problem.*—EDITOR.

FAMILY life is the result of the long period during which the human child is dependent on his parents. Birds and animals quickly learn to take care of themselves, and, for this reason, the tie between them and their parents snaps. Off they go and, in most cases, the parents separate also. Thus the world in which these lower forms of life live is a world of separate individuals, not only independent of one another most of the time, but frequently unfriendly, each fighting against the creatures around him.

Human children, however, can not get along without the mother's care and the father's support. Brothers and sisters do their part, also, in the family circle. Sometimes the grandfather and grandmother who are in close sympathy with the men and women who are still their "children," unite the last years of their lives to the younger generations and become workers in the home-hive. Thus we have a large, loving group all depending on one another, all serving one another.

How has this group become possible? Through working together. The more we do in the right way for the members of our family, the more we love them. The more they do for us in the right way, the more they love us.

There must, however, be wisdom in the doing. Our purpose should be to add to the strength, the self-reliance and the self-respect of those whom we serve. To remove all sense of responsibility and influence from elderly people is a mistake. Grandfather should be more than a chore boy, and grandmother more than a nurse. To give them no other work makes them unhappy and ashamed and hastens old age. Give them a chance to put to use the knowledge and skill that are theirs. Let them serve the home, for in so doing they will be happier.

So, too, we must not keep children dependent longer than is necessary. We should show them how to be self-helpful. Let us serve them as teachers, but not as slaves. On the other hand, we do a bitter wrong when we demand from the young child harder or more perfect work, or longer hours of it, than are healthful at his or her age. Our young people must serve us not as slaves, but freely as true and loving partners.

Coöperation in Family Life

It is easy to give the feeling and spirit of partnership even when hands are too old or too little for service. At least we can ask, "Would you rather have me put up plum or apricot jelly?" or "Which do you think would be prettier to plant, pansies or petunias?" Thus home becomes a network of sympathies, of mutual interests, of labors shared in spirit even when hands are feeble or untrained.

Unless husband and wife are partners, home is not all that it should be. Without true partnership there is a waste of money, time, and strength. Partnership is impossible unless knowledge of the household finances is shared by all grown-up members of the family. Each should have the management of a just percentage of the income—not as a gift nor as an allowance, but as his or her share of the business. The farmer could not run his farm without the women at home who manufacture wholesome food and clothing out of the crops and dollars he contributes. As junior members of the farm-and-home business, the children earn their shares and dividends.

The division of the budget into separate funds is often helpful, certain amounts being put aside each month for food, clothing, health-precautions, repairs, charities, "higher things" (such as magazines, papers, books, vacations, and parties) and investments. Such funds greatly increase the interest we feel in managing money, and make us more saving and give a good balance to family life. For the older children keeping these accounts is valuable training in arithmetic and neatness.

Homes exist partly for the sake of mutual labor, for the sake of honestly making money. They exist also for the sake of mutual pleasures and amusements. For both of these aims, coöperation is necessary. Time for pleasures and amusements can be found only in the well-adjusted household, where each member has his or her tasks, so arranged as to fit well into other people's tasks.

FIG. 116. "Human children, however, can not get along without the mother's care and the father's support"

Systematic Management in Family Life

Time and strength can be saved by system in our movements, by the order in which we take up our tasks. Not all women can afford to have labor-saving machines, but all women can have an orderly way of doing their work. They can have labor-saving habits. Perhaps this sounds like poor comfort, but it must be remembered that machines have to be operated and kept in working condition by human hands. So unless the housekeeper knows how to do her work without unnecessary movements, confusion, and interruptions, all the time-saving machines on the market will not give her leisure and strength. On the other hand, a wise, orderly system, with only fair tools, may produce this leisure and save this strength.

In the year 1910, a new system of labor was introduced into some of the largest of our huge industries, such, for instance, as the Bethlehem Steel Works. A man named Frederick W. Taylor studied the way in which a gang of men picked up and loaded pig iron. As a result of his study he learned that a great deal of the strength of the men was wasted by the way in which the "pigs" were placed. They were constantly stooping and lifting when it was not necessary. The loading-vehicle was also awkwardly placed in relation to the men. By making a number of changes along these lines, and by having regular rest periods for the laborers, Mr. Taylor trained them to load 47 long tons of pig iron daily instead of 12½ long tons and with less fatigue. Their wages were increased accordingly. A man named Gilbreth did something of the same sort for bricklayers, finding that they had been making 18 motions in laying a brick, whereas 5 were enough.

This same idea has been put into housework by Mrs. Christine Frederick, an authority on home economics. Of course, we must admit that a home can not be run exactly like a factory and that we do not want it to be. A woman is bound to have many interruptions, so that her "system" will not run like that of factory employees. Nevertheless, there are ways open to most women whereby they can save about 20 per cent of their time and strength without buying anything.

To get this result, study each task and, if there are in your family people ready and able to help you, study them and find out which task each is best able to perform. Divide up the work according to what the members of the family can do best, and let each do his or her share regularly day by day

and week by week. Then watch the way in which you go about your work, ask your helpers to do the same with theirs, and see how many improvements can be made.

Labor-saving habits. Here are a few suggestions for labor-saving habits: When putting clothes to soak, soak the starched pieces separately and keep them separate through the processes of washing and ironing. This saves lifting and examining pieces. In hanging them out, push the clothes basket on a cart or barrow and attach a bag of clothes-pins to the line, to be pushed along as needed. In ironing, place the basket on a chair. All these things save stooping and retracing of steps.

In cleaning, first sweep all the rooms, then wipe all the floors, then dust. This saves many trips to pantries for the purpose of putting away certain tools and getting out others. Windows should be left to be done together another day.

In cooking, collect all materials before starting to make anything. If the worker will try to picture the lines on the floor which her steps would make as she comes and goes about her work, she will see that many of these crisscrossing paths are unnecessary. She will then make one path do where there were three before. So far as possible, we should prepare at the same time those dishes which take the same kind of materials and mixing. We should sit down to work when we can, and should have a chair or stool of convenient height. Bowls and mixing dishes, when screwed firmly to a table, require no energy to hold them securely.

In sewing, we should cut out the garments which are alike, or almost alike, at the same time; then stitch all the seams, hem all the hems, and so on until the work is done. This will save time. It will help if we choose our days and hours for each set of tasks with the hope of getting through them without confusion. (See also "System in Farm Housekeeping," p. 165.)

Recreation for the Farm Family

Let us decide in our own minds why we are running our homes. Is it just a bitter toil, necessary because we have become wives and mothers? Is it to win fame among neighbors as fine housekeepers? Or is it for the sake of making our families as healthy and as happy as possible? If the latter is the case, then it is a part of our housekeeping, a part of our purpose, to keep ourselves "good fellows" for the sake of husband and children, and to provide for the family leisure and play as well as shelter, food and clothes.

The need of it. Wastefulness has been one of the mistakes of American life. Now, as one of the results, we have worn-out farms and often, too, worn-out men and women. Therefore, one of the important tasks of the farm home is to put back into the workers by means of play, the energy which has gone out of them in the form of work. Good times are the clover, the alfalfa, the nitrogen-producing crops of the home!

No family so much as that of the farm is dependent on itself for amusement, because community life, even in neighborhoods where it is most active, is hard to reach. The creation of leisure and the good spirits put into play are, therefore, matters of great importance and depend almost entirely on the housewife. If she shoulders the responsibility of making them a part of her housekeeping, she may look forward to the reward of a family whose efficiency is truly increased—as the productivity of the soil is increased by crop rotation—and to a household of young people who can feel that their best good times are enjoyed on the home acres.

An 8- or 10-hour day can hardly be enforced in the country, yet it is possible to come much closer to it than is ordinarily done. What is necessary is for the housewife to have in her mind a time limit for her work, and to hold as closely as possible to it. If she does not set any limit to her hours of toil, except a few for sleep, she is sure to become a drudge, for there is always something more that can be done. Therefore, she must learn to stop after a certain amount of time has been spent on the home tasks, although she may know that more work remains to be done.

How to get it. Certain hours should be set aside for family play. Saturday afternoons, for the children, at least, should be vacation time. Work should be made lighter

FIG. 117. Good times are the clover and alfalfa crops of the home. Let all the family share them

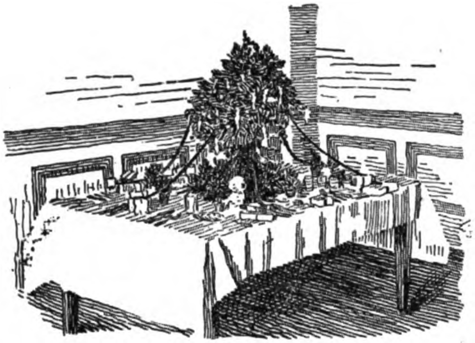


FIG. 118. Table decorations for birthday and holiday festivals bring cheer and variety at a cost of but little effort and less expense.

on Sundays. The farm woman should not have to prepare a big dinner on the day we are commanded to rest. Most people eat too much rich, heavy food at all times, and especially on Sundays.

Birthdays should be celebrated by little parties. Picnics bring real refreshment. At some season of the year, each member of the family should have at least a week's vacation, leaving the home and getting inspiration from new surroundings.

There are the absent members of the family, the grown-up children, whose places are always sadly vacant to mother and father. They, too, have a duty to the life of the family in which they were reared, and should make every effort to get home on such festivals as Thanksgiving and Christmas. The power to give the joy they can by returning, should more than repay them for the loss of any more exciting celebration among strangers. Festival days ought to be filled each with its own flavor and spirit. Let the old-fashioned Thanksgiving dishes, so far as economy permits, load the table. Let Christmas smell of evergreens and sparkle with tinsel and shining, many-colored balls. These things lie around the very heart of family life.

The automobile. The automobile is responsible for many of the changes in country life. It is giving pleasure daily to thousands of farm families. "For to behold this world so wide" is a desire of almost every human heart, and to speed along strange or only half-familiar roads, to rush past houses where lives unknown to us are being lived out, supplies just the relief which we need from the pressure of our daily toil. Different from this refreshment and even more important, is the opportunity an automobile gives us to reach friends whom we could not reach on foot or with a horse; the chance to get to church, to clubs, to stores. If our own homes are to be stocked with cheerfulness and good humor, we must get out of them sometimes and draw upon the funds of wisdom, good sense, and fun which are stored in other homes. We must visit our neighbors. Although telephones bring us a sense of companionship and many a pleasant chat, still they can not take the place of visiting. We need to watch the light in our friends' faces to see them at work, to gather to ourselves the spirit of their family life.

However, to enjoy this pleasure, like other pleasures, one must have a free mind, and the car should not be purchased when, in order to do so, the home itself is endangered by a heavy mortgage, or the dollars which had been laid up for the rainy day must be used. Before buying, one should be able to see clear through to paying for the car and maintaining its upkeep, including insurance. On some farms, an automobile is a source of income, making possible the quick marketing of produce and serving many other farm purposes. (See also Volume III, Chapter 4.)

Vacations. Some families tell of refreshing vacations spent in a tent or tents on the home grounds. The house is thoroughly emptied of provisions which would spoil, and is locked up as if the family were gone on a journey; it becomes almost a matter of honor not to enter it. On some shady spot near water, and preferably out of sight of the house, the necessary number of tents for cooking and sleeping are set up. A kerosene or gasoline stove is put in the kitchen tent together with whatever other equipment is necessary for the simplest picnic fare, for in order to enjoy this vacation, life must be reduced to its easiest and simplest. Cots are set up in the sleeping tent, or the ground may be covered with waterproof cloth and mattresses, or blankets or boughs may be stretched upon it for sleeping. A bowl and pitcher, a box of trunk, tables, and a few comfortable chairs, and the camp is complete.

Out under the trees the simplified life of the family goes on. There are no rooms to clean, so the housekeeper has time for reading. She should bring with her just the books which give her most delight. It may be that this nearness to nature will turn her heart to poetry, or she may long to increase her sense

FIG. 119. Just because they live and work in the country, is no reason why farm folk should not enjoy picnics and other vacations.

of change and distance by plunging into the lives and habits of other people and countries, through novels and stories of travel. Again, she may find her greatest delight in bulletins showing her how to perform more easily the tasks to which she must presently return. The point is that she should choose what rests and refreshes her, never forgetting that this is vacation.

The children should romp, play games, and be care-free. Carpentry adding to the comfort of the camp will interest the boys; and sewing of a favorite kind will increase the girls' enjoyment. Reading aloud while handiwork is being done doubles the pleasure of the hours. Possibly the farmer himself will at first consider this vacation at home a silly performance, but he is on record as becoming a convert to it in a day or two. It cannot fail to be a satisfaction to feel that the family is having a rest and a good time with the expenditure of very little money, especially when that expenditure is for equipment which can be used many times.

Portable houses have become popular of late. They are more expensive than tents, but still within the reach of those who have but little to spend. They can be carried in an automobile and set up by any handy man or woman, and they are weatherproof and solid. Hotels are often willing to have them placed rent-free on their grounds, the table board of the occupants compensating them. Such a house will bring many a pleasant trip within the means of a farm family.

It is worth while to watch in the newspapers for the advertisements of railroads and steamboat companies, showing special rates to certain places for a week or two. These corporations will also supply information about hotels and boarding houses on request.

Expositions, fairs and institutes offer opportunities for many pleasant trips. True, these require some work and study, but it is possible to obtain rest almost as thoroughly by means of a change of occupation and scene as by being idle.

There are various ways in which the members of the farm family may enjoy themselves. One large family in which there are many grown sons, each with his own family, has for years enjoyed an annual squirrel hunt, which is made an excuse for a two or three days' outing in the woods. The hunting grounds are only a few miles away, so that the journey is one on which the smallest children may be taken safely. On these trips the aged grandparents, the grown sons, and the grandchildren are brought together in a happy, care-free way.

Another family, in which there are several grown sons and daughters, camps each year near the state fair grounds. In addition to seeing the fair at but little cost, all have a fine outing together.

On some pleasant day in autumn, it is fine for all the members of the family to spend a day in the woods, gathering nuts. There are also many other opportunities for family gatherings. The neighborhood picnic, in which several families whose farms adjoin or lie near one another combine, is also well worth while.

The best thing about all the pleasures in the country is that they may be homemade instead of being bought ready-made. Then, too, the outings are held where conditions are such as to make them healthful and productive of well being and right living.

The beautiful part about a vacation is that it lasts long after it is over. It even takes on new interest as it lives in the memory. It keeps on warming the heart and brightening the mind, and lasts as did the widow's cruse of oil. It gives the members of the family more to talk about together. So those little bickerings and misunderstandings which sometimes come up between members of the same household—no matter how much they love one another—are kept out because there are other things to occupy the mind. Perhaps the best test of a successful vacation or party would be: "How long is it going to last in our memories and increase the good nature and sociability of our family life?"

The Problem of Hired Help

The problem of hired help, both in the house and in the fields, is yet to be solved. In fact, instead of being settled it becomes each year a still bigger and more difficult question. The city woman has trouble keeping servants, but her troubles are small as compared with those of the farm woman. In the first place, it is very much more difficult to keep a hired girl in the country. In the second place, the farm woman has the added problem of the hired man, frequently of providing him with board and rooming place.

Help in the House

(*By* Ruth M. Boyle)

The scarcity of help. A good many of the housewives in the country, after many unsuccessful efforts, have come to the conclusion that they cannot keep help in the house. While a few are succeeding, they represent the exception rather than the rule. Undoubtedly, wages for women workers in

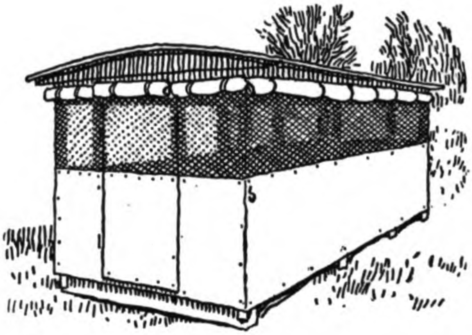


FIG. 120. A portable house provides excellent vacation accommodations for the whole family and can be taken on a picnic packed away in an automobile trailer.

the country, in many states, have been too low. However, where pay has been increased, help has continued to be just as hard to get as it was when wages were lower. In practically every state where surveys of the labor situation have been made, the same conditions have been found. Because of the scarcity of help, many country families are moving to the cities and towns in order to lessen labor, which, in many cases, has proved too heavy for the housewife to keep up year after year. This movement from the farm to the city is of more than individual or family interest. It is, in fact, a national question. If we are to maintain a high standard of life, we must continue to have in the country as high a class of citizens as the nation develops. But first of all, there must be kept on our farms a sufficient number of producers to feed the millions whose homes are in the cities. So the question of how the housewife is to keep help, or how she is to get along without it, is really of very much more importance than it might at first appear.

The attraction of work in town or city. While higher wages—or, at least, what may seem to be higher wages—have, no doubt, caused many girls to prefer town or city homes to country homes as places in which to work, there are other considerations. One of these is a shorter work day. Another is more opportunity for pleasure and recreation. The wider use of labor-saving machinery and the greater number of modern conveniences in the city home also prove attractive to the girl who cooks or does other housework.

Keeping help in the country. Of course, we cannot, nor would we, have conditions in the country the same as in the city. We cannot put a motion picture show on every farm. We can, though, through community effort, provide some kind of recreation and entertainment for all. A little thought, too, will often make it possible to interest the hired girl in some of the farm work by making her a partner, perhaps in the poultry business, in the garden, or in fruit production. Short hours every day in the year are not possible on the farm, but by careful planning of the work some of the trials of even the most strenuous seasons may be done away with. Of course, a comfortable room, all for her very own, will go a long way toward making the hired girl satisfied. In the country, too, where people are thought of more according to what they are than what they do, the hired girl who is worthy may enjoy social privileges which she cannot have in the city. The greatest aid, though, in keeping help in the farm home will come through the use of labor-saving machinery, including modern heating, lighting and water systems. Of course, there is just as much difference between hired girls as there is between the women who employ them. To think of all of either class as alike would be wrong. In the solution of this problem, as with many others, understanding and sympathy, together with fair pay for services rendered, will help.

The Hired Man

(*By* WM. L. NELSON)

Not all farmers employ hired help. Of those who do, some use it for only a few weeks or months during the busy season. Others prefer to keep at least one man all the year round. The latter plan is by far the more satisfactory provided there is at all times work enough to keep the hired laborer profitably employed. The hired man of the right kind, unless he is a specialist, generally prefers an all-the-year-'round job; while, as a rule, the man having a family will not consider short-term employment. (Chapter 5.)

On farms where at least one man is kept all the year 'round, the most satisfactory arrangement is to hire a married man, and provide for his family as comfortable a tenant house as can be afforded. It may be that this man will board the extra hired men when they are needed. If so, the problem of regular help will be lifted from the shoulders of the farm housewife.

In many cases, such an arrangement cannot be made. The farm mistress, then, must board the hired men herself. It may be that these men sleep in the same house, and in winter at least, spend their evenings in the family sitting room. Under these conditions, the most important fact to the farm woman is not that she will be required to do so much more cooking, or clean an extra room, but that the men her husband hires are going to live in her home in close intimacy with all the members of her family. Children often come to think a great deal of the farm help; it is most important, then, that the influence which these men have over the youthful minds be a thoroughly wholesome one.

Giving the hired man his due. The man who can be taken into this close intimacy in the family, has certain rights in his turn. He has the right to a clean, comfortable sleeping room, to wholesome food, and to the same kind and amount of courtesy and consideration that is asked of him. He may not care to spend every evening with the family any more than they wish to have him. He should, therefore, have a stove in his room, a good light, and a table at which to read or write.

On a farm where several hired men are employed, one of the best plans for saving the housewife and giving the family privacy, while at the same time making the men contented and comfortable, is to have a hired man's room—not a bunkhouse or place for them to sleep, but a room in which they may gather to read and talk or write letters on Sundays and after work hours.

Such a room might be provided with washbowls and towels so that the men could come to it directly from the fields instead of going through the kitchen. It should, of course, be easily reached from the dining room. There should be a row of hooks on which to hang hats and coats, and some provision should also be made for other possessions. A built-in seat, chairs, and a table with farm papers and writing material should be provided also. On some farms such a room might also be used as the farm office.

Many farm women complain that hired men are not personally clean, and for this reason are not pleasant to have in the house. In many cases the fault lies less with the man than with the farmer who fails to provide bathing accommodations except the washbowl and roller towel. Under such conditions, in winter especially, the men become very careless; but generally this can be avoided by providing suitable bathing facilities.

Plans for keeping help. The problem of securing help in the fields is not yet such a difficult one as that of getting help in the house. Each year, though, farm help is becoming more scarce. As has been said of the hired girl so may it be said of the hired man, that, while wages have, very properly, been advanced, workers have become harder to get. In some sections, especially during times of war or unusual demand for laborers on the part of manufacturers, crop acreages have been reduced because help could not be had.

How to meet this problem of a shortage of farm help is a big question. Many plans have been proposed but not all of them will work; in fact, only a few suggestions seem worth referring to here. To make the quarters of the hired man, whether he be single or a man of family, comfortable and pleasant is well worth while. A limited form of profit-sharing in crops or stock, returns from a few acres of ground, or some live stock as his own, have proved helpful in keeping the best men.

FIG. 121. The farm family has both need and opportunity to provide its own recreations; games are invigorating sport for young and old.

Some farm owners have done away with the vexations of men leaving just when they were most needed by giving bonuses in the form of extra pay to those who stay throughout the year. In order to secure at all times the best work and the greatest amount of interest from the men, the plan of allowing a certain per cent on the year's returns from the farm, has also been put into practice in some places. Where men are hired at certain wages per month on a year's contract, it is always a good plan to provide for more pay for harvesting, threshing, silo filling and such work requiring extra help. There will then be less cause for the regular help's "flying up" on the job, and even the most faithful will feel better satisfied under such an arrangement.

Feeding threshing crews and other extra help. Every farm woman, at some time during the year, has to provide for a crew of men—the harvesters, hay balers, silo fillers, or threshers—ranging in number from half a dozen to 20 or more. Then it is that the managing ability, the judgment, and the strength of the housewife are put to the test.

Neighborhood customs have much to do in determining just how these larger meals are to be prepared and served. In some communities, the custom is for the women whose husbands usually join forces on these big jobs also to take turns at helping one another. In other sections the woman who has a crew of men to look after, relies upon hiring extra help or doing the work herself, possibly buying bread and some other articles of food.

FIG. 122. Canning outdoors. With all the beauties of the country close around her, the farm woman should find or make it possible to enjoy more of them in the midst of her work.

CHAPTER 12

The Farm Woman

WE speak of the farmer's life and work as complex and varied, but certainly the duties of the farm woman are no less complicated, no less varied and, above all, no less important. For she is not only the "food administrator" of the farm—with all the responsibility that the supplying of fuel for hard-working and hard-playing bodies involves,—but also the guardian of clothes; the high priestess of the hearth and the living room; the living expression of the "first aid" idea; often the regulator and timekeeper of all home activities and family plans; and ever the source of assistance, comfort and cheer for whatsoever member of the whole farm family needs help or advice. Sometimes, it is true, her ability and willingness to fill this many-sided office are not realized, taken advantage of, or appreciated. More often, however, everything she can give, is sought,—but, oh, so little is given her wherewith to make her tasks, even the ones she loves, easier! One of the greatest advances that has come in agriculture has been the improvements along the lines of labor-saving systems and devices for the farm home. Yet this same field remains one in which a very great deal has yet to be accomplished.

This chapter covers the four phases of the farm woman's domain. The first deals with system in housekeping; its value and how to attain it. The second considers the various phases of the food problem—the planning, preparation and serving of meals and special food materials. The third treats what may be called farm furnishings—the choice and care of textiles, bedding, linen, etc., as well as the principles of sewing and of home laundering. The fourth covers the essential points in the care of the sick on the farm. Every woman may feel—and many of them with every right to do so—that she knows more about her own housekeeping than any one else can tell her. Nevertheless, persons who have made special studies and experiments into this field, realizing and taking into account all its sides, have arrived at certain basic conclusions which can be of the very greatest benefit in many a home. It is these principles and their general application, rather than specific directions, that are discussed here.—EDITOR.

A. SYSTEM IN FARM HOUSEKEEPING

By Mrs. Virginia C. Meredith *of Indiana who can lay claim to the titles of teacher, writer, editor, lecturer, farmer and farm woman in all that the name implies. After the death of her husband in 1882, she assumed the active management of their farm—one of the oldest in the region—and its herd of purebred Shorthorns and flock of Southdowns. Here for 30 years, and later on a new farm which she herself developed, she has achieved notable success as a breeder and exhibitor. Meanwhile she also became deeply interested in the modern development of home economics, and, when the University of Minnesota opened its school of agriculture to women, she was called there to start the work, with which she remained for 6 years. During that time the expansion of the field of extension work offered an attractive opportunity for further service, and she has ever since been active as a speaker in Institute and Short Course work in many states. Meanwhile she has become a contributor to the agricultural press, her writings covering a wide range of subjects relating to livestock, the farm in general, the farm home, and the farm family. Her acquaintanceship among successful breeders, and her activity in progressive organizations have had a further broadening influence that increases her ability to tell other farm women the things they want to know, in the way they want to be told them.*—Editor.

AN overwhelming majority of farm women in the United States is composed of individual women who perform all the labor of their own households with perhaps some little irregular help given by children. The daily tasks of each woman are such as belong to the mistress of a home, the mother of a family and to general housework. They include everything from the rearing and disciplining of children, the entertainment of visitors, the buying of clothing and household supplies, the selection and preparation of food, to every kind and description of cleaning, including the scrubbing of floors and the adequate ventilation of bedrooms.

Naturally the performance of this varied work requires a high order of intelligence; fortunately, intelligence may be acquired and developed almost without limitation. Inevitably this work requires for its performance a large share of the working hours of each day, and these hours are limited; they cannot be lengthened or multiplied by any means whatever. It follows, therefore, that if the housekeeper cannot add to her available time, she may, and indeed must, use whatever time she can command in the very best way. It is her part not only to discover but also to use a system suited to her house and to her family. This system will develop a plan to save her own labor, time and strength, while at the same time promoting the health, comfort and usefulness of the family. The efficiency of the system will depend upon the worker's knowledge and use of good methods; also it will depend greatly upon the tools with which she works.

Efficiency in any field whatever, in household management as well as in civil engineering, is based on a clear understanding of the problems to be solved. Unfortunately a full comprehension of its problems may easily escape persons engaged in an unorganized and complex industry like housekeeping, where there are no recognized nor accepted standards either in quality, labor or scale of living. In every community, however, there are some women who, by knowledge, experience and executive force, have mastered the complex business. They seem never hurried, never behind time, meals are well chosen, well cooked and served regularly; children are clean and suitably dressed; the house is always in order; canning and preserving are promptly done in season; they have time for visitors and visiting, for the club and for church.

A practical housekeeping plan. An analysis of the system used in one well-kept house ought to furnish the basis for a working plan for every house. While it is quite impossible to make a plan that suits every home, it is likewise impossible to make a plan that will suit the same home every week in the year. Nevertheless, a plan may be found that has coherence, however elastic

the administration of the plan may be. A suitable system is always the result of an adequate survey of what needs to be done plus an estimate of the labor, the knowledge, and the time available for the doing of it.

The Elements of Perfect Housekeeping

Every house, speaking broadly, has 3 centers, namely, a labor center, a living center and a sleeping center. To manage and bring these into proper relations, one to another, and each to the fundamental needs of the particular family they serve, without overemphasis of one or neglect of another—this constitutes perfect housekeeping.

The labor center (p. 168) is primarily the kitchen, where food is prepared and where dishes and utensils are cleaned. It also includes the laundry where the cleaning of soiled clothing is an essential task. System in this center is based on a correct knowledge of methods, while efficiency is dependent largely on the tools that are used.

The living center (p. 173) is the family sitting room where all meet to sit, talk, read, study or play, and the dining room where the family comes together at least three times a day. The living center is the heart of the home, it exists for the development and enjoyment of each member. Efficiency here is dependent upon the knowledge represented in the selection and use of furniture, floor coverings and wall decorations and the choice and care of a system of lighting and heating.

The sleeping center (p. 175) where about one third of the life of each member of the family is passed, determines in a marked degree the personal health and usefulness of each individual. Efficiency in this center is dependent upon the knowledge of sanitation and hygiene which the housekeeper is able to express in her purchase of bedding and its subsequent care, and through her plan for ventilation. Efficiency in this center is peculiarly important because, when asleep, one is unconscious and cannot change conditions; moreover, the physical system is relaxed during sleep and so is very sensitive to whatever conditions, good or bad, the housekeeper may have created.

FIG. 123. Is washday in *your* house a laborious, primitive, disheartening chore like this?—

Family habits may promote good housekeeping or, on the other hand, they may render it impossible. Family habits may "just grow" like Topsy in "Uncle Tom's Cabin" or they may be established through coöperation and by long and laborious teaching, by precept and example. Where right habits, related to housekeeping, are established, they contribute strongly to the smooth running of the household machine, they become, in fact, a priceless lubricator that reduces wearing friction.

"**A budget** is a detailed plan of anticipated income and expenditures for some definite future period of time, as a week, a month, a year; it is intended to control expenditures during that period." The housekeeper is concerned with the expenditure of labor, knowledge, time and money in whatever pertains to the home. The expenditure of money is constant in 4 distinct lines: (1) for existence, (2) for comfort, (3) for culture, and (4) for philanthropy. A wise distribution of the income along these lines is most surely accomplished by the forethought that grows into a plan which is called a budget. Modern housekeeping recognizes in the budget a dependable basis for efficiency in equipment and maintenance.

A Plan for the Week

Sunday, according to the calendar, is the first day of the week, but in the American home it is practically the last day—a climax toward which all the interest and activities move, making it a day for family life at its best. The family ideals determine, not only its use, but the nature of the household work for the day. One family translates the thought of a day of rest into habits of laziness, another considers it a day for feasting and emphasizes the heavy Sunday dinner; one believes it to be for the promotion of neighborliness and devotes the day to visiting, another thinks it is intended to be a change from the labor of the other six and gives it to recreation and outdoors. Modern ideals of parental duty may produce a special responsibility on the part of the father toward the small children so that he assumes a Sunday care of them that turns the day into one of comparative rest for the mother. Some hold to the old and venerated ideal which sets apart the Sabbath to be a time for religious instruction and worship; these attend church and Sabbath school.

Monday usually finds the entire house in more or less disorder after the semi-holiday of Sunday; therefore it becomes the logical time for setting in order, sweeping, dusting and doing light cleaning. It is, too, a convenient day for baking and any other general preparation that will reduce the cooking for the following day, which is to be wash-day. The clothes that are to go into the weekly washing should be collected and looked over; there will always be some articles that need the kind of mending which can be better done before, rather than after laundering, such as darning table linen, and mending lace and other garment trimmings. Assorting and mending the clothes and putting to soak overnight such as require it, is a plan of work that divides between two days the time and labor that are required to do the family washing. Consequently it reduces the weariness of the task as a whole.

Tuesday should be the universal family wash day. It is early enough in the week to permit the ironing to be finished without dragging along to the very end, and yet it has a previous day of preparation, not only for the washing itself, but for lightening the daily work of household routine with its inevitable three meals on wash day. The plan of Tuesday's work will include an oven dinner, which reduces the necessary attention and labor given to the preparation of food.

Wednesday. Whether or not this shall be ironing day is a debatable question. For many women, it seems desirable to separate the washing and ironing, both of which demand that she shall be on her feet almost continuously. The intervening day may well be devoted to sewing or some similar work that admits of sitting. There is a too prevalent tendency to conclude a piece of work by hurrying to "get it over," that may lead to an intemperate devotion to the task itself without a due recognition of the fact that efficiency is not so much a matter of time as it is of methods which finish the work in hand and then leave a residue of energy and a state of mind capable of enjoyment. If ironing is to be done on Wednesday, it deserves to be done with good tools that save the time, labor and comfort of the housekeeper. The built-in ironing board and the self-heating smoothing iron are conveniences adaptable to every home and at a cost within the reach of every farm woman.

Thursday is the day when the unusual, irregular, but necessary things may be given attention; there are a general looking over of cupboards and household stores, the polishing of silver, airing of bed clothing, and kindred tasks that can be grouped or separated. The attention to household stores is a matter not merely of cleanliness and order, but also of economy, when overlooked supplies are brought forward for use while they are usable. In this connection there is a bit of work that

FIG. 124. Or have you taken advantage of modern inventions to make it merely an item in an interesting, varied, enjoyable life of activity?

may properly belong to this day, namely, the planning of meals for a week. Competent stewards in hotels and restaurants plan the meals for a week or more in order to economize in material by properly combining foods. The housekeeper in her narrower domain can lighten her labor, save materials and reduce cost when she has a plan of meals for consecutive days. Such a plan is workable when it becomes a matter of personal trial backed by a thorough belief in the wisdom of devoting brains, as well as time, to everyday uses.

Friday is popularly considered as sweeping day, although the housekeeper who is enterprising enough to have a plan for the week is likely to make every day a cleaning day, in a limited sense at least. With her housekeeping well in hand, she may keep Friday afternoon for visiting, or permit the claims of a club composed of a group of neighbor women to have first place; it may permit a trip to town for shopping, or an hour of enjoyment at the public library, or a real visit to a relative. Such use makes this an important day and its privilege is a duty, which, if properly discharged, is far from being a negligible part of housekeeping, because it brings into the home new topics of conversation, forms taste, and fosters friendships that have lifelong influence. These things of sentiment are so dependent upon efficient housekeeping in their opportunity for expression, that the housekeeper must estimate them as a part of her plan.

Saturday is the busy day when cleaning house and extra cooking in preparation for Sunday take a prominent place in the day's work. Putting on fresh sheets and special care of the beds, getting clean clothes in order for the family and readily accessible, all these require time and must not be neglected.

Planning for the Seasons

After the Christmas holidays, when the days are beginning to lengthen and before outdoor activity is possible, is the logical time

to accomplish household sewing; the time when the store of sheets, pillow cases, tablecloths, napkins and towels may be replenished for the year; when aprons, wash dresses and undergarments may be made up. With this general and necessary sewing out of the way, that which is special and seasonal, like summer or winter dresses, is not burdensome.

Early summer brings the important work of putting away winter bedding and clothing with the necessary cleaning and protection from both dust and moths. This season, too, is the time for making jellies and jams from the berries and small fruits. The work in this connection is much lightened if jars and glasses as soon as emptied are thoroughly cleaned and put away secure out of reach of dust, preferably in their original pasteboard cartons. In this way the labor connected with their sterilization is made inconsiderable.

Later in the season there is care of the vegetable garden, the canning, drying and preserving of the larger fruits and the storing of vegetables and fruits for winter use. Last in the year is the heavy work of rendering lard, making sausage and other items connected with the home curing of meat.

The distribution of this seasonal work, when it finds the housekeeper prepared to despatch it, is easily managed. It becomes burdensome only when there is no plan or preparedness.

Making housekeeping easier. There are six main sources of information relating to changes and improvements in housekeeping, namely, bulletins issued by the U. S. Department of Agriculture and by the extension departments of the agricultural colleges; attendance at farmers' institutes; membership in homemakers' clubs; the advertising pages of the better class of farm journals; catalogues of reliable firms; and visits to well-equipped homes and to big stores.

These sources of information fall into two groups since the first three relate to methods, and the second three to adequate equipment. Under some circumstances, an improved method may save as much time and labor as a good tool. This is illustrated in the making of bread at home; when the short process is used, there is no setting of sponge over night, little kneading is required, and by baking in single pans, a thoroughly good and palatable loaf is secured. That good tool, the bread mixer, saves both time and labor when many loaves are to be made at one baking, but on the other hand, the care of the mixer itself requires more time and labor than it saves when only two loaves are made. The short-process method is just as valuable with many loaves as it is with few, while the bread mixer, as a tool, proves of greatest value only when many loaves are made.

The increasing lack of household help that is at all helpful is one of the main reasons that are causing the housekeeper to seek improved methods and better tools, and to spend on these the money she would willingly pay to a competent helper.

FIG. 125. The kitchen must always be a labor center, but it is for the farm woman to make that labor a happy, productive, broadening one, not merely a chore.

The Kitchen—the Labor Center

In the kitchen, the greatest single factor in saving labor is in the nature and arrangement of its furnishings. The work performed there falls into 2 main groups: (1) the collecting of materials and utensils for the preparation of meals; and (2) afterward, the cleaning and putting away of the utensils and the disposal of "leftovers." Hence it follows that the position of stove, table, cupboards and sink in their relation to each other is an important point in saving steps. A long room rather than a square one, suits

FIG. 126. Too many farm homes mean drudgery and wasted energy.

the most convenient plan, that of having the main furnishings ranged around the walls.

The painted wall is first choice. Often, however, this must be modified, but always, from a sanitary standpoint, the use of a wash is to be preferred to paper. Where the floor is laid with good flooring, it should be left bare; if oiled at intervals it will present a good appearance and will nor require undue labor in its care. Linoleum is a desirable covering that secures warmth. It is easily kept clean and bright with a mop, using no soap but adding 1 part of skimmilk to 10 of water. The bare floor, if rough and uneven, is not a suitable base for linoleum and, much less so for the cheap grades of oilcloth and fiber coverings; such a surface should first be covered with building paper.

Water. Water shares with heat a first place in the kitchen equipment. Providing an ample and convenient farm water supply requires an outlay that in some cases amounts to half as much as the cost of the comfortable house it serves, yet it may be an economic answer to an hourly demand. The water system, when installed, saves labor and time and promotes health in a satisfactory way. In an old house, the water from the cistern can be brought into the kitchen with little expense. A galvanized iron pipe and the ordinary pitcher pump will deliver it at the sink. This operates easily and saves many steps and much heavy lifting.

The white enameled sink and the pump should be built in with a work table extending along the wall, with the sink directly in front of a window. The housekeeper and no other should decide how high sink and table shall be from the floor. The drain board will be at the left of the sink with the pump at the right. The table 2 feet wide and 5 or more long, is an extension of the frame that holds the sink and pump. The whole structure should stand on legs, and be open beneath, not with closets. The waste water is carried away by a pipe with a trap and well-laid tile. This simple addition to an old kitchen may be made by any carpenter and at a moderate cost. The top of the table should be heavy and of one piece. Cypress, although soft, is a satisfactory wood that may be had in wide sizes. Any wooden table top, however, may be covered with zinc. Should one not wish the covered table, zinc forms at least a fine facing for the wall back of the table. It is easily kept clean and with a long 8 inch shelf above it completes a good type of kitchen work table. Many housekeepers will find a small movable table a convenience for extra occasions.

The kitchen stove or range. The first decision that must be made by the housekeeper is whether the cooking range is to be used for the one purpose of cooking or shall it serve also as a heating stove. If there should be a furnace in the house, the decision is already made. If there is no furnace, then there remain two choices, the first being a cook stove that is also a heater. The objection to this is that during the summer it renders the kitchen a very uncomfortable place for one who must spend a large share of her time there. The second choice is a range which uses gas and depends upon an ordinary heating stove for winter use in the kitchen. The advantages of the gas range are that it reduces the time and labor needed for cooking meals, it gives a better control of the oven, and does away with unnecessary heat in summer; it does not require a chimney and therefore can be placed with its end near a window in order to secure the best light, without any regard to the location of the chimney. The later models of gas stoves using gasoline or coal oil are so constructed as to be entirely safe under the management of a careful housekeeper.

The fireless cooking range. The best adaptation of the principle of fireless cooking

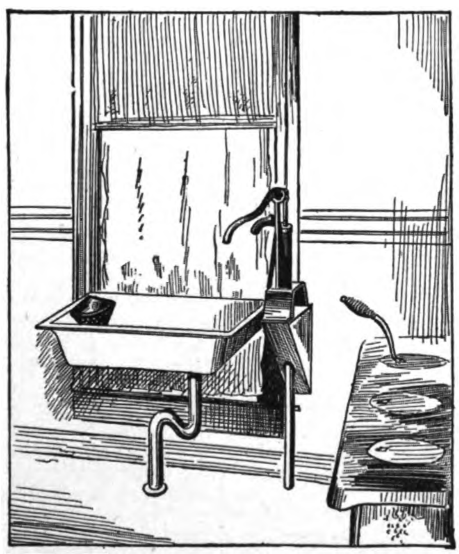


FIG. 127. A kitchen pump, sink and drain pipe in the kitchens should cost not more than $15, and get result in immeasurable saving of time, energy and health.

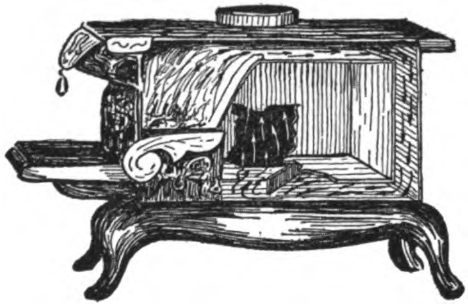


FIG. 128. A modern coal range partly in section to show the course of the drafts

is the gas range which has an oven built to conserve heat so that when it becomes heated, the gas jet may be turned off, and bread and meats will bake perfectly without any further consumption of gas. The woman in town will probably prefer a fireless cooking range that uses manufactured gas, but for farm women a range that uses gas generated from gasoline or coal oil is the only choice, unless acetylene gas is available. Those of the latter type come in acceptable styles and at moderate prices. Gas cannot be generated from gasoline in a cold room, and to some persons this is an objection to the gasoline range, but the reduced labor and cost of fuel required for cooking on a gasoline range the entire year will more than offset, in most cases, the labor and cost of heating the kitchen either by furnace or by the inexpensive small sheetiron stove during the winter.

The fireless cooker. That the fireless cooker has failed to reach the full degree of popularity which it deserves is due, perhaps, to its misleading name; but whatever its name and whatever its reputation, the device itself is wholly reliable and a very great help to the housekeeper who will use it as directed. The principle expressed in its construction is that of saving heat that has been first secured in the usual way by the combustion of wood, coal or gas.

The compartment that receives the food which is to be cooked contains also the heated stones. This compartment, usually round, is made of metal and is placed inside a wooden or metal box with a space of several inches between the two. This space is packed with mineral wool or similar material that is fireproof. This plan of construction is intended to conserve the heat for a long period. With meats, and some vegetables, this long, slow cooking secures a palatable product very much better than can be secured otherwise. When such uncooked food as chicken, a beef or pork roast, or beans for baking is put in the fireless cooker it needs no further attention for 3 or 4 hours, and indeed, if left for a longer period will not be hurt in any way. It is this fact which constitutes the value of fireless cooking. The housekeeper may leave the Sunday dinner to cook while the family is at church and without any fear of accident from fire and with the assurance that a hot dinner will be ready on her return. An afternoon in town or at the club may be quite care-free when she is sure that all is going well at home. The fireless cooker is of especial assistance at harvest time or during corn shredding and silo filling when its compartments will take care of the heavy cooking. One should carefully read the instructions and recipes sent out by the manufacturers in order to learn what to attempt and what to avoid. The housekeeper will soon become mistress of the situation and know how dependable the fireless cooker is within its limits.

When buying a fireless cooker, one should investigate the different types, as each year witnesses valuable improvements that enable one to get more value for the same price than was possible previously.

Cupboards. Cupboards have such a useful place in the kitchen work that their construction and placing deserve especial consideration. When the kitchen is longer than it is wide, a type that has proved satisfactory in use is a double one, really two sets of shelves placed back to back with the usual doors opening out from the two sides. When this double cupboard is placed with one end against the wall, it has the effect of dividing the room to a certain degree. This style of cupboard should be about 4 feet wide and should extend from floor to ceiling. It will take care of table dishes, cooking utensils and grocery supplies, protecting all from dust and contributing much to the orderly appearance of the kitchen. Placed near the middle of the room, its double doors on one side will open toward the cooking range, which is at one end of the kitchen, while the doors on the other side of the cupboard will open toward the sink placed at the other end, with the work table midway between sink and

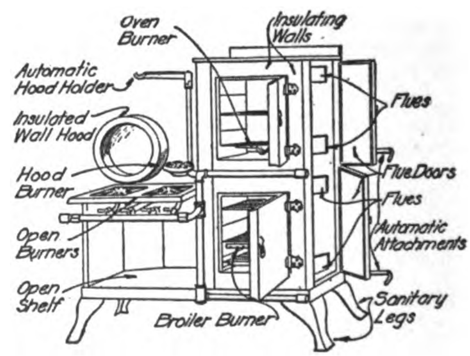


FIG. 129. Where city, natural, or home-manufactured gas is available, the gas range is a great comfort and convenience, especially in summer.

Fig. 130. The fireless cooker rightly managed is a great labor- and fuel-saver. It may be bought, as in this case, or made at home (see Fig. 105).

range. The upper section of this cupboard should have rather shallow shelves, the doors opening over an 8-inch extension that makes a convenient ledge about 40 inches from the floor. Here there should be drawers, perhaps 6 inches deep. The space below the drawers forms a lower cupboard with adjustable shelves. The carpenter who builds the work table can build this simple but very convenient arrangement of shelves with doors.

Another type of cupboard, liked by some as a step saver, is built in the wall between the kitchen and the dining room with doors opening into both rooms, thereby allowing the clean dishes to be placed on the shelves directly from the sink in the kitchen, and, when they are needed in dining room, to be taken directly from the shelf in that room.

The dumb waiter. The kitchen equipment may include a dumb waiter easily handled by ropes and used to convey the food placed on its shelf to the cooler cellar below, to be kept there between meals. This shelf, or waiter, moving in a vertical shaft can be made by any handy person and will save the housekeeper many trips up and down the cellar steps.

Flour bin. A container that is both convenient and clean is a hanging flour bin containing 50 pounds, made of tin and with a sieve at the bottom that is operated with a crank like the common flour sifter. The flour is put in from the top and securely covered with a lid. When the bin is hung on the wall by its wooden panel over the extra kitchen table, it will be found extremely convenient and economical, since no flour is wasted as is often the case when it has to be dipped out of a flour chest or sack.

The meat grinder. The meat grinder is an indispensable tool in the kitchen. In fact, its name does not convey an idea of its manifold uses. Probably no one service it performs is so helpful as the grinding of bread crumbs. The scraps gathered during several days, when dried crisp in the oven and put through the grinder, may be kept a long time if placed in a clean dry glass jar and left uncovered. Thus prepared, the crumbs are not only saved but they are a very quick help in making scalloped vegetables and fruit puddings. Nuts for cakes and for salad may be ground and kept until needed, and fruits, such as pineapple that is to be used in jams and marmalade, may be pulped in the meat grinder.

Knives. A full equipment of knives is essential in the efficient despatch of cooking processes. There are numerous kinds especially adapted to various uses. One kind that cannot be spared is the *bread knife* with its scalloped edge. This knife is used for no other purpose and should be kept hanging with the 12-inch bread board on which the loaf is sliced. The *paring knife*, short and sharp, must have a firm handle, preferably of metal and of a piece with the blade. Such knives should be bought in pairs or triplets. The dull heavy butcher knife or old case knife is not a substitute for the efficiency of a real paring knife. A *grape fruit knife* with its curved blade is almost indispensable in preparing grape fruit and oranges for the table. *Scissors* are extremely useful in shredding lettuce without bruising it and for clean cutting of fruits for salads. Until a pair of long-bladed scissors are included in the equipment, one does not realize their usefulness in the kitchen.

The pineapple and the strawberry nipper, with a score of other small conveniences, have a right place in the kitchen of every one who wishes to save her own time and labor and also secure satisfactory results in cooking operations. Inventors and manufacturers constantly add to labor-saving devices on sale in the big stores.

Spoons. Wooden spoons intended for use with fruits and acid mixtures are a welcome addition to the kitchen collection. Their noiseless operation fits them for beating cake batter, and they contribute decidedly toward saving the finish of utensils that are used when the stirring of the contents is necessary.

Spatula. The spatula, with its broad, long,

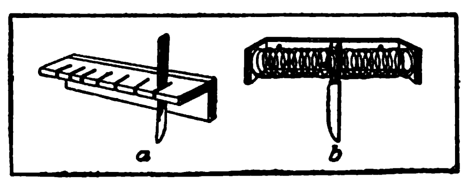


Fig. 131. Convenient kitchen knife racks: *a* is of wood; *b* is a stiff, spiral, wire spring

FIG. 132. A well-arranged kitchen work table and shelves. The wooden strip to keep utensils in place is better than tacks or a groove in the shelf.

thin blade and dull edges, is a valuable tool for turning food and for lifting it from the pan. For this it is so much superior to a knife that it is in constant use. It is helpful, also, in skillfully transferring the dough of cakes and biscuit from the rolling board to the baking tin.

Utensils and wares. Modern improvements are nowhere more marked in number and in value than in household utensils. The iron pot and skillet used in earlier times have been almost wholly superseded by many types of utensils and many kinds of wares that efficiently serve the housekeeper. The double boiler has now become more useful than the teakettle, combining as it does the two advantages of being easy to clean and making impossible the scorching of delicate food. Earthenware baking dishes are in almost universal use because they not only hold the heat, but also can be used in serving the food cooked in them, and are easily cleaned and scoured. The more expensive transparent wares are durable and attractive. Aluminum deserves its popularity on account of being light to handle and easy to clean. Tinware seems to be going out of use because of its poor quality of late years. Granite ware, except in the very best quality, has but a short life usefulness.

The stool. The introduction of the high stool, to be used at the kitchen work table, marks the development of a sane sense of the importance of saving woman's strength wherever and whenever this is possible. Many forms of work that could not be done when seated in a chair, can be done perfectly when seated on a high stool. Sometimes, and for some women, it seems vastly easier to get the stool than to get the habit of using it—doubtless due to a lingering tradition that bustle and hurry mark the capable woman, and with no comprehension of the fact that plan and poise distinguish the modern woman's efficiency.

The basement laundry. A generally approved model for a farm house includes a basement or cellar with windows large enough to admit ample light. When there is a gentle slope to the grounds, an outside entrance may be on a level with the ground. This has many advantages: (1) It permits having a washroom for the men which they can reach from the barns, on a level, and where extra clothing such as overalls and coats may be hung. (2) It gives easy access when storing apples and vegetables. (3) When water and a stove are provided, canning, butchering and washing can be done there, thus taking from the kitchen a class of work that entails more or less disorder and dirt. (4) If a motor is installed in the basement, it can pump water for both house and barn, run the cream separator, the washing machine, and the churn, and indeed relieve the farm woman of a long line of heavy work.

The self-heating iron. While the farm woman is denied the use of the electric smoothing iron, she can have a self-heating iron that uses gasoline. Such an iron is moderate in price, entirely safe, and the woman who once uses it would not willingly do without it. It not only saves steps and does good work in less time, but also saves fuel and the undue heating of a room. The price is within reach of almost any farm woman. ***An ironing board,*** when used in the kitchen, may be fas-

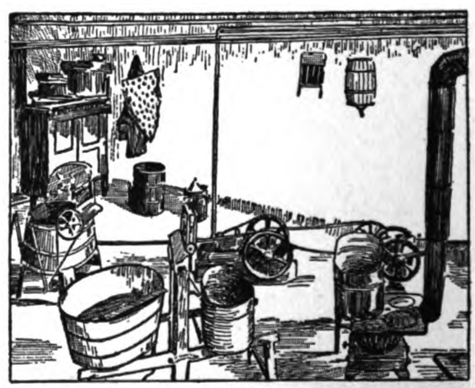


FIG. 133. A basement laundry with gasoline-engine-driven equipment. Washing can be done here in all weathers without disturbing or obstructing the kitchen.

FIG. 134. A handy mop wringer

tened to the wall with hinges, and, with its hinged leg, folded back against the wall and concealed by a paneled door, if desired.

Cleaning. Cleaning is the main business of housekeeping. Washing dishes and cooking utensils, scouring table and sink, mopping floors, laundering clothes, sweeping carpets, cleaning rugs, airing beds and rooms, constitute an endless routine that becomes endurable and is performed with joy only when the housekeeper has good tools with which to work and when she believes that cleanliness is a costly beauty and intimately related to health. Hot water, soap and plenty of clean wiping towels make dish washing fairly easy until some great inventor puts on the market a practical dish washer for family use.

Brushes. A full assortment of brushes contributes to the saving of time and labor and to thoroughness. The small, inexpensive fiber brushes should be bought by the half dozen, some to be kept exclusively for cleaning vegetables, like potatoes and beets, others for the sink, with larger ones for scrubbing. After using a brush it should be put away with bristles down. There are *scouring powders* to be had that are far better than soap in their power to remove greasy dirt easily and quickly. The various kinds have various uses. Better ones appear every season and these deserve to be sought out and used. *The mop* is useful within its limits. It will not reach corners but it is of great help in cleaning floors. The ease of operating it is increased when a pail is used that has a device for wringing the mop without the need of touching it with the hands. This device can be bought and attached to any pail.

Disposal of waste. Here, perhaps, more than at any other point, the housekeeper may demonstrate her mastery of her business. Everything that comes into the house must go out via some safe channel. Water needs a waste pipe to carry it to a safe distance or a safe place where it will not menace the health of the family; the sweepings from the floors must be disposed of in a cleanly, sanitary way, preferably burned. The waste from vegetables and fruits, such as parings, and the scrapings from cooking vessels and scraps of food past using, must find their way to the garbage pail, which should be covered and frequently emptied in order that it shall not become a nuisance.

The Sitting Room—the Living Center

The labor connected with the care of the living center of the home depends upon the selection and use of its furnishings and upon the family habits of order.

The care of the floor. The kind of floor and its carpet, or rugs, are outstanding points of interest because the choice that is made in their selection determines the amount of labor that must be expended in their care. The expensive hardwood floor will have to be waxed and oiled, but its good appearance may be considered worth the labor. This floor admits the use of rugs which are regarded with favor, due, in some degree, to the convenience with which they can be taken out of the house for cleaning. The painted floor, which is much easier to care for than the hardwood, will, with rugs, meet the modern sanitary demand for less dust in the house. Many persons, however, prefer a floor entirely covered with carpet.

The vacuum cleaner is invaluable in the care of carpets and rugs. Its popularity is due to the thoroughness of its work. Dust and dirt are taken through the action of suction, di-

FIG. 135. The vacuum cleaner whether hand- or electric-driven represents the easiest and most hygienic method of keeping the house free from dust.

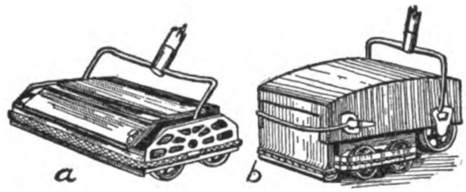


FIG. 136. Carpets and rugs require the use of a good carpet sweeper (a) or better still, the improved, combined vacuum cleaner and sweeper type (b).

rectly from the carpet, into a closed bag or box that can be emptied outside the house where they may be burned. The use of the vacuum cleaner not only reduces vastly the work of dusting everything in the room, but through the absence of dust prevents the furniture from growing prematurely dull and shabby in finish. While some farm women cannot make use of the type of vacuum cleaner that is operated by electricity or other power generated by machinery, yet they will find on the market styles to be operated by hand which are thoroughly satisfactory in the results obtained by their use.

The carpet sweeper, an arrangement of rolling brushes enclosed in a box, retains its usefulness because it is light and can easily be run under and around the table after each meal, and in the sitting room every morning, thus quickly brushing the surface and securing neatness while the thorough cleaning is taken care of weekly by the vacuum cleaner.

The draperies or curtains for the windows should be given especial thought and be made to serve the use of the windows. They should be hung to admit light freely and be of material easily cleaned. The color of the walls is important and it is not wise to be wholly controlled by fashion in choosing wall papers. One should remember that the plain papers of light tan, gray or cream tints are cheerful; while large patterns in the heavy reds, greens and blues, reduce the apparent size of the room and are depressing to many persons, although children, and even older ones, are not conscious always of what influence it is that irritates or depresses.

The lighting of the farm house is usually its weakest point in regard to efficiency; being denied electricity and manufactured gas, except in rare instances, the usual source of light has been the kerosene lamp. Probably few forms of work are as distasteful as the cleaning and filling of kerosene lamps, while the light itself is too often dim, dull and depressing instead of being cheerful and sufficient. There are now made portable gasoline lamps that are absolutely safe and give a better light to read and sew by than either the average electricity or gas; being without a glass chimney they practically require almost no care. Whatever may be done about the rest of the house, when there is no lighting plant installed, at least the family living room should be equipped with light that insures no injury to the eyes and illuminates every section of the room.

The open fire should be a feature of every family sitting room; it represents the sentiment of the hearth without which farm life would be barren and lacking in the essentials of personal development. The care of an open fire of wood or coal is much lessened when a chute opening from the hearth carries the ashes directly to the cellar below whence they can be removed at convenient intervals and thereby avoid their dust in the living room.

Furniture. *A large center table* is an essential piece of furniture; it should be substantial, plain in style so that it may be quickly dusted, and without cross pieces below, that would tempt the feet of children to mar its finish. It must be large enough to hold comfortably the papers and magazines in daily use and to give the children a place on which to study if they wish.

Chairs are found most satisfactory when the needs of each member of the family are remembered in their purchase, the small chair for the little tot, the strong, well-built armchair for the man, a restful low rocker for the mother. The mistake should be avoided of buying a chair for its looks disregarding its construction or comfort. Old furniture is the vogue, not because it is old, but because it was made by hand in a day when cabinet makers respected their trade and used only good material, building well and on good lines without meaningless frills.

A couch or lounge is a desirable addition to the living room, not for ornament, but to invite and permit the horizontal position, the value and restorative powers of which housekeepers sometimes fail to appreciate during the quiet time that every life needs sometimes during every day.

Book shelves give to a room a note of fine living that has no substitute; the dusting of books is a care cheerfully bestowed. A combination writing desk and bookcase may be convenient but will not prove as good a choice as separate shelves. But under any circumstances, there ought to be a convenient writing place, with its supply of stationery, pen and ink. Many farm people are negligent in the matter of business and friendship letters, often because of the lack of writing materials kept in a convenient place.

In hanging *pictures* on the walls of the home, one adds decidedly to the sum of labor required for its care. Therefore they should be chosen with deliberation, for a reason, and sparingly. One picture that is inspiring or restful is to be preferred to many that have no meaning. There are scores of pictures suited to an art museum for every one suited to hang in a home. A comparatively safe purchase is represented in reproductions of

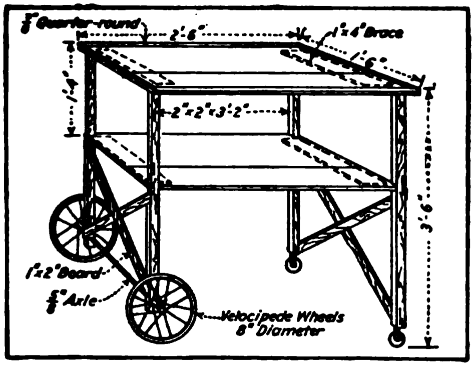


Fig. 137. Plan and dimensions of a tea-cart that can easily be made at home. With the scarcity of hired help, such aids have become invaluable.

pictures that have been endorsed by the good taste and judgment of cultivated persons. The choice among such pictures is so wide that it does not limit the personal preferences of any one, whether portraits, figures or landscapes are liked.

The enjoyment of music has been emphasized by the popularity of so-called "talking machines" of various kinds; these bring to the farm home a class of music that formerly was heard only when rendered by artists in large cities. The mechanical player piano is another boon to the unskilled music lover and both additions to the list of recreations serve a high purpose in country homes. They are not, however, complete substitutes for the very personal gratification of being able to actually play on the piano, violin, or other musical instrument.

Choosing the furniture of the living room of the family naturally is a life-long endeavor. Taste changes and ideals grow. Both these should be embodied in books, pictures and music, but also, they will be expressed in chairs and tables, in lamplight and firelight, in provision for the child's development, and in the elders' growth in knowledge and power.

The full use and complete enjoyment of the living center of the home will depend upon the housekeeper's management of her business. She may have to send the family washing to the town laundry and the milk to the creamery. She may have to concern herself with the hired help situation by endeavoring to bring to pass a livestock system of farming that can use married men and provide them with tenant houses, thereby taking hired men out of her home. When all is said, the farm woman still has a power of choice. She can, within certain limits, decide what to do and what to leave undone, in order to secure for herself and her family, health of body and mind, and the joy that attends right development of the mind and soul.

The dining room. A separate dining room entails some additional labor but it promotes a restful serenity by reason of its detachment from the scene of heavy work in the kitchen, and this, in the end, is helpful. If there is a place to save labor, there is also a place to spend it and the fitness of the spread table, when the family gathers around it, is a prime consideration in housekeeping. The spotless cloth and smoothly ironed napkins are worth their cost; the use of good china will teach children to respect good things and train them in habits of careful handling. The room and its special use being somewhat apart from the hourly routine, ought to be made to instil a sense of what family association means in promoting conversation and good cheer.

The tea-cart, originally intended to be an accessory of fashionable serving, has developed into a real help for the housekeeper. It can be used in carrying dishes back and forth, it may hold the coffee and cups, or it may hold the dessert and changed plates. A tea-cart stationary in the dining room may be ornamental, but is of no assistance whatever. When used habitually, it becomes a good investment in saving both time and labor.

Cleaning silver. It is doubtful if there is anything better for cleaning silver than the old stand-by, Spanish whiting, used dry. There are many good preparations to be had, but the best way to save labor in the care of silver is to polish often and at short intervals.

The Bedroom—the Sleeping Center

Good taste and sanitation go hand in hand in the approved modern furnishing of a bedroom, which, being a place intended for one main use, is furnished for that purpose. The labor connected with the sleeping center of the home depends upon the choice of furniture, mattresses and bed clothing. While every one may prefer to buy from the home merchants, yet it may happen that these do not carry a full line of goods which allows a wise choice. A good mattress should last a lifetime. Indeed, a hair mattress of the best quality will last longer because it can be

Fig. 138. The bedroom should be attractive, but simple and easy to care for and keep clean

cleaned and made over indefinitely. In the selection of any article destined for long use, the housekeeper wisely buys where she has an opportunity to see and examine critically various types of the article. Then, after she knows what is in the market, she may buy whatever suits her purse. The bedstead, springs and mattress are bought with the expectation of using them for a long period, and no outlay is more inexcusable than purchasing a poor type of spring and a cheap mattress when these are to be in use for at least eight hours out of every twenty-four.

The mattress, kept clean and fresh by frequent airing, is covered by a special mat or light quilt put on underneath the sheet. Sheets made at home are more desirable because they can then be made 24 inches longer than the mattress. In this length, the lower sheet protects the mattress and the upper one folds over to protect the bed clothing from being soiled by the hands and by the breath. A short sheet is an abomination.

Many housekeepers prefer to make at home bed covers intended for warmth, using cotton batting covered with light-weight cotton cloth. These are comfortable when new, but they soon mat and when soiled, cannot be easily cleaned. The all-wool blanket has more warmth with lighter weight on account of its peculiar fiber. It is easily cleaned and with good summer care will last for years. Such a blanket is more expensive in first cost, yet when it can be afforded it may, in the end, prove a better investment than cotton comforts. There are those who believe that the animal fiber of the woolen blanket is more healthful than cotton fiber.

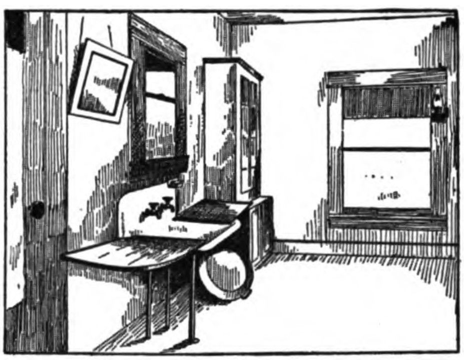


Fig. 139. A well-arranged kitchen, as far as it goes. A table near the window, a range at the right and an icebox in the foreground would permit rapid and efficient handling of meals.

The bedstead may be of metal or wood, according as fashion or taste may determine. Either is an equal care. Both hygiene and comfort prescribe a separate bed for each person. When two persons occupy the same room, twin beds should be used.

The furniture of the room should be simple and without upholstering to catch the dust and thereby add to the labor required in its care. Likewise, the window curtains should be of wash material. This is easily laundered and will not hold dust.

The floor, whether it be of hardwood polished, or plain boards painted, should not need hard labor in its care. Rugs that can be taken out of the house for dusting may be of whatever quality one wishes and can afford, from the homemade, heavy rag rug to the oriental; the choice will make little difference in the labor required.

A bedroom furnished simply, if it has capacious closet room, may with a general cleaning once a week be kept sweet and fit without the expenditure of any great degree of labor. If there is not a bathroom in the house, then the bedroom furnishing must include some provision for water, pitcher, bowl and towels. This one item demands painstaking labor and scrupulous daily attention. In fact, this care is such a task that housekeepers generally consider a bathroom with a running water supply as one of the very greatest aids to housekeeping.

Fresh air is the efficient agent that cleans the bedroom of the foul air that has been used by the lungs during sleep, and also of the excretion from the skin, which, as an organ of excretion, is more active at night than during the day. This latter fact explains why two sheets should be used on the bed and why they should be aired every day and laundered frequently.

The labor required for the care of the bedroom is considerably reduced when it is a family habit to open the bed and the windows before leaving the room each morning, and when each person drops his own soiled garments into the clothes hamper promptly, instead of leaving them for another to pick up and put where they belong.

A plan for buying. The "budget" differs radically from the wife's "allowance" because it is the result of counseling together and considering the wisdom of every class of expenditures and the welfare of each member of the family before an apportionment of the expected income is made. Housekeeping with a budget is based on a plan and becomes a business with definite aims which are sure to be realized by adequate equipment and correct methods whose necessary costs are provided for.

It is ever questionable economy to buy what is not needed nor likely to be

needed in the very near future. There is, however, a wise forethought that leads to the purchase regularly of certain things to replenish the household equipment. For example, sheets and pillow cases, table cloths, napkins and towels are in constant use and wear, so it is right management regularly to replenish these stocks before the supply on hand is exhausted. Six sheets that might endure several washings and then be too worn for use would, if kept in reserve, prove very useful in the event of illness. It is, therefore, good housekeeping practice occasionally to buy new sheets and to use them while the old ones are kept in reserve for an emergency. The same is true of table linen and kitchen towels.

In buying groceries there are certain articles that are not affected by long storage, while others quickly deteriorate. Sugar in a dry room, where ants do not have access, may be kept indefinitely. Flour will improve with age for a limited period, if kept in a well-ventilated room. Soap improves on being kept. Flavoring extracts, baking powder and similar goods are much cheaper in the larger containers, while breakfast foods, cereals and roasted coffee must be bought in small quantities.

Buying in a good market where a large stock of goods may be examined is sometimes very advantageous. In buying articles such as kitchen range or cooking utensils, which are all the time being improved, new types should be seen and examined. Often a merchant engages to handle but one make or style of a manufactured article, and this of course limits the choice. The insistence of a traveling agent may prove a trap for the unwary, but for one who knows, and who has a plan for buying, this source may in some cases prove a convenience. Meritorious articles are sometimes introduced in this way because local dealers are under contract to handle something else.

Family habits. The ancient rule, "a place for everything and everything in its place," sounds easy, but, in fact, is extremely difficult to put into operation as a plan of every-day action. Only the very modern houses are built to provide a place for everything. The average farm house is the despair of a housekeeper when she attempts to enforce an orderly system. If there is no closet or corner for the coats, hats and rubbers which the children have worn to school, it is to be expected that inevitably chairs and tables will be used. Family habits, to be agreeable, must have a working chance, and it would, when possible, be better to surrender a room to miscellaneous and unclassified uses than to have the entire house cluttered with miscellaneous and unclassified articles belonging to the several members of the family.

When a child does some one thing for the family meals, such as bringing and pouring the water, slicing the bread or carrying out the plates—some one thing done regularly and in the right way—there is established the dependable habit of helpfulness. Even when the task is no more than sweeping a porch, winding a clock, or feeding the cat and dog, it nevertheless contributes to reducing the sum of required labor in housekeeping. Habits that do not require labor but which demand thoughtfulness are strongly contributory to smooth housekeeping. "I forgot" is one of the most exasperatingly unkind hindrances to comfortable housekeeping.

The importance of relaxation and change. The foremost duty of every woman who is the mother head of a family is to build up and maintain her own health of body and mind. This is not selfishness, but rather preparation for service, because it is impossible for any one to do her best for others until she has first done the best possible for herself.

The farm woman, perhaps more than the town woman, is dependent on her own lead. In the country, there is a lack of the agencies which promote

amusement, recreation and popular instruction; in the country very little enjoyment outside the home is furnished ready-made and to be had for a price, as it is in town. These considerations put upon the farm woman an obligation to create whatever forms of recreation will promote her own welfare, the welfare of her own family and the welfare of her community. The latter is important for it is apparent to every thoughtful observer that the community influences strongly the child in the home.

Change through going away from home occasionally or periodically is a duty, whether one comes back to-day or not until next week. Change whets the edge of appreciation and understanding, and renews interest in the routine of every-day life which otherwise might grow dull and monotonous to a paralyzing degree; change renews the strength of the will, and renders the mind more elastic and capable of considering new ideas. Change itself brings relaxation.

Fig. 140. The farm woman's life demands frequent change. She should "cut loose" now and then.

Association with others is the greatest refreshment to the soul, as many groups of women have found. *The woman's club*, as it has been developed of late years, is distinctively wholesome and so broadly inclusive in its interests that it may well fill a large place in the life of a farm woman. Whenever a group of women with neighborly spirit organize for social and educational purpose, they secure for themselves a degree of enjoyment and inspiration quite out of proportion to what it costs. There are many societies organized in the churches and by national associations for particular propaganda like missionary work, temperance, suffrage and so on, and the farm woman wishes to keep in touch with these fundamental interests.

The woman's club, though, differs wholly from these. It brings into association the women of the several churches and associations, it breaks down lines of division, and unites all in the paramount interests of their own community, their own children, their own development. Personal effort changes to mutual effort.

The *home economics club* is a popular type in rural communities. There the farm woman finds familiar interests that lie in the field of her own experience, and when discussed by the group, these afford a very personal stimulus and may indicate lines for coöperation of the most inspiring nature. While membership in the club may increase her work and the demand upon her time, it is, nevertheless, a means of relaxation because it is a change. Moreover, it reacts upon her necessary routine at home; it gives to her the enjoyment that comes through a better understanding of the why and how of home making.

An established agency that may furnish relaxation for the farm woman if regularly used, is the *public library* in town. She may have books at home, and certainly she will not find time to read in the library, but the large list of magazines kept there will provide an hour of real pleasure. If she merely turns their pages and looks at the pictures, she will gain knowledge of current world affairs and many suggestions for topics of conversation at home. And, too, in every up-to-date library she will learn what it is doing to serve children. This will enable her to coöperate intelligently at home, and thereby to enlarge the home life to include new forms of relaxation.

Another agency recently established is the *county farm agent*. The Federal Government is endeavoring, in coöperation with the several states, to place in every community the services of a farm adviser and a home adviser. By seeking, directing, and using these local agencies it becomes possible to develop forms of coöperation among neighbors and to organize groups of people that can create conditions such as will make harmless amusement and innocent recreation accessible to all. These agencies, however, are barren until used. By seeking and using them, the farm woman may secure a good form of relaxation that comes from a changed interest; she may find an outlet for whatever ability she has that has been suppressed, an outlet for aspirations that hitherto have been repressed.

Developing and maintaining a hobby is not only a sure road to relaxation but, in the case of farm women, it is a safe one because not likely to become the main concern. Rather, will it remain an incidental interest. When Secretary Houston of the U. S. Department of Agriculture asked 22,000 farm women for a statement of their social, labor, economic and educational needs, the published replies indicated strongly two main lines of thought. First, there was expressed a desire for better social and educational opportunities for farm children; second, a wider opportunity to gratify one's own love of the beautiful in the home and its surroundings. In harmony with

the latter, the cultivation of flowers and shrubs becomes a useful hobby, and by being mainly an outdoor activity, it contributes to both good health and good spirits. The tired, melancholy, discouraged outlook and the fretful, nagging temper disappear when one knows the joy of the successful tending of flowers and shrubs. One woman interested in the germination of flower seeds began growing peonies—the "piny" of grandmother's day. She eventually produced flowers of amazing variety and some of great beauty. At length she devoted 10 acres to her plantation, thereby turning the venture that began as a hobby into a commercial enterprise; this illustrates not business opportunity but the boundless opportunity for developing a living interest in the little things that are at hand and all about us, the things that offer relaxation from the main business of daily housekeeping.

Another woman finds real recreation in the care and breeding of a flock of poultry and has two interesting strings to her bow. First, she has the breeder's satisfaction in controlling the conditions that create life, in seeing chicks develop into hens with the conformation that determines function; she sees the color and marking of a feather become what was decreed for it in her choice of breed and mating; she reads the poultry journal with zest, and attends the poultry show with eager interest. Second, she sells eggs for a price! That egg production, as a specialty and an outdoor activity, is well intrenched in the favor of farm women, is demonstrated by a record of eggs sold from farms (not commercial plants) in one year for more than $300,000,000.

The farm woman can contribute three things to her community's welfare, namely, her personality, her knowledge and her home. When she contributes her home she very probably will get back something that is of inestimable value, something that is in fact a wholesome relaxation from her usual housekeeping. The recreations of young people need to be enlarged and centered in the home; chorus singing, little dramatics and other harmless expressions of social life are encouraged by the woman who offers her home, generously and ungrudgingly, to the young people. Too often the elders spoil the fun by assuming all the labor of preparation for company. Party refreshments that are a burden to one woman, are a lark when made ready by half a dozen boys and girls; decorations that would tire one housekeeper beyond endurance, are arranged and become sport for four or more young people.

The woman who contributes her home with an atmosphere of good cheer, secures in return a touch of the spirit of youth. For her, whatever is unlovely and a burden falls away; she is a new creature in her faith and in her belief that all is well with the world.

Hobbies for the Farm Woman

(*By* Mrs. Helen Johnson Keyes)

To be contented, every farm woman should have a hobby. There is leisure time even on a farm, and its happy employment puts new strength into a woman's heart to overflow even her working hours, filling them with content, and bathing all the family life in sunshine. Every one acknowledges that it is our duty to be good, faithful workers; more and more the truth is being appreciated that it is our duty also to be good, diligent players. Of course, one can play and find recreation without a hobby, but unless one has companionship, such play and diversions are often unsatisfying. A hobby, however, *is* a companion, and in playing with it we shall not feel alone even though the others of the family are absent.

The Joy of a Hobby

The farm home is fortunate which has as a housewife a woman who loves to make things. There are many hobbies for her to choose and so long as her fingers are busy on some work of skill she will be happy. Fancy work, basketry, china painting, photography, even carpentry, upholstering, or the refinishing of old furniture which she finds dusty and damaged in the attic and can make attractive for the home, are all within her powers.

Women riding such hobbies will find their pleasure greatly increased if they do not depend on manual skill alone, but acquire also an artistic knowledge of their materials and

methods. They must train their eyes so that they can combine colors pleasantly, and learn to choose those designs and shapes which will serve their purposes most simply and well. The best of the women's magazines give splendid education along these lines.

Fig. 141. Flowers provide a hobby that is always enjoyable and that can often be made profitable.

Music. The hobbyist who likes to make things will prefer to play and sing rather than merely to listen to music. The woman who thus enjoys music has a refuge from loneliness, fatigue, and depression, even though her performance is not skilled. Her pleasure in playing will be greatly increased if she adds to the delight of creating beautiful sounds a little knowledge of how music is composed—how, for instance, a composition is based on a little tune, a sequence of notes, called a theme or motive, which is developed through different keys, and threads its way in many strange disguises through many hiding places, finally to be heard again. It is fascinating to follow this theme, and to the truly musical ear and soul, it may tell in its wanderings a deep story of the human heart. There are two delightful books which will help any music-maker who wants to go as deeply into her subject as this, namely, "How to Listen to Music," by Henry Edward Krehbiel, and "Appreciation of Music," by Thomas Whitney Surette and Daniel Gregory Mason.

The women who really enjoy studying and experimenting to increase their abilities are the Marthas of the farm. Without them many of the activities of the United States Department of Agriculture, many of the projects of the Smith-Lever Bill, would fall on barren soil. They are the yeast in the farm home. Their hobby is *improvement*, and it may be along almost any practical line. To the outsider, their diversions may seem so much like their work as to be scarcely refreshing, but they never become drudges because their hobbies put enthusiasm into all they do. Whether they choose poultry, bees, gardens, house-improvement, church work, or club work, they will find a valuable collection of bulletins theirs for the asking, or for the asking plus a few cents. For full lists and instructions they should write to the United States Department of Agriculture, the United States Bureau of Education, the United States Public Health Service, and the Children's Bureau, all in Washington, D. C., and to their own state agricultural colleges.

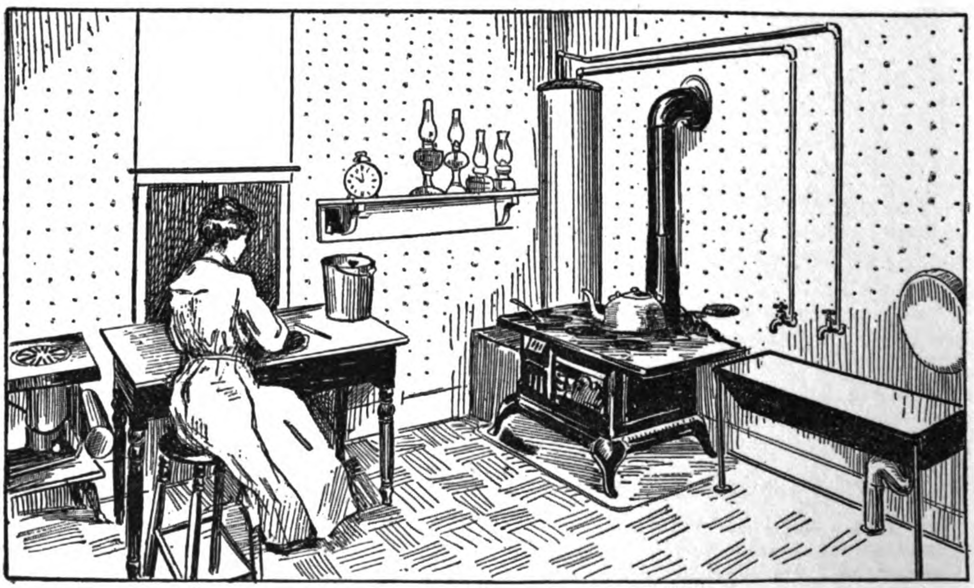


Fig. 142. There is no more useful hobby than that of striving for greatest efficiency with the least effort. The kitchen is a great place for its practice

Hobbies as Sources of Pin Money

It is often possible to make a hobby the source of a small income, particularly if it has to do with making or doing things. Literary and musical hobbies are not easily turned into money on the farm.

Whatever pin-money labor is chosen, two things are necessary to its success: (1) A careful study of the market to see what things are wanted and where they can be sold to the greatest advantage; (2) satisfying that market by making or raising a superior quality of whatever is to be supplied to it.

The market may lie near home or it may lie in a city some distance away; it may be most profitable to sell to a dealer, or to build up a trade directly with consumers. These are questions which depend on local conditions and for which every woman should find the correct answer before starting her pin-money drive.

In any case the work should include advertising in newspapers and the use of notices of what is offered tacked up in post offices, etc. Every article sent out should be of high quality and attractive appearance. All should be standardized and thoroughly dependable from top to bottom and from month to month. These features will prove the best advertising. The pin-money earner should keep her accounts carefully, entering in a ledger her expenses, receipts, and gross and net profits. Accurate bookkeeping on the American farm has frequently revealed the surprising fact that hard work was being done at actual money loss.

In some rural communities there is often a good sale for tasteful fancy work. Plain sewing of a serviceable kind, such as aprons, children's rompers and overalls, and bags of various sorts, also find buyers. Occasionally it is possible to do the weekly mending for families spending vacations in the neighborhood. If a woman has a camera she frequently pleases people with pretty views of the countryside which may be sold as pictures or worked into fancy articles, such as blotters, calendars, or writing tablets.

Places called Women's Exchanges exist in many small towns, as well as the larger cities, where fancy work, food products, etc., are offered for sale on commission. If not sold within a reasonable length of time, it is returned to the maker without charge. A membership fee in the exchange, however, is payable by every one placing work there.

Editors of farm papers are glad to buy clear photographs of curiosities in scenery, of fine plants, stock, convenient devices, and unusual and practical buildings or parts of buildings. The pictures submitted must be very clear and sharp, and have a shiny finish, and they should be accompanied by a description of what they are intended to show.

The amount of money which can be made out of the so-called small industries of the farm—fruits, vegetables, flowers, pickles, preserves, honey—has been one of the surprises revealed by accurate bookkeeping. While a wheat farmer, for instance, may have been laboring for a net return of, say, \$8.00 an acre, his wife may have been raising a few onions, cucumbers, and strawberries at a profit of \$100 an acre! Or perhaps she has been making good the losses from extensive grain farming with the profits from her flock of poultry. Every one enjoys eating; indeed, every one must eat. Foodstuffs of superior excellence will always find a market; if they do not require the use of machinery, and if they can be sold directly to the consumer at retail prices, the profits from them should be considerable. Oftentimes their cultivation is within the range of ability of the farm woman. Fruits, vegetables, flowers, plants, pickles, honey, jams and jellies, poultry products, medicinal herbs, parcel post dinners ready prepared—these are only a few suggestions towards the development of which farm women may direct their ingenuity in their spare moments.

B. FEEDING THE FARM FAMILY

By BAB BELL, *in charge of the Home Economics Extension Work of the Missouri State Board of Agriculture. Born and reared on a Ralls County (Missouri) farm, she taught a rural school for a year, and later studied Education—especially in Home Economics—at the State University, graduating in 1911. She organized the Department of Home Economics of the Hannibal High School the same year, remaining there as teacher for 2 years. From 1913 to 1915 she was Institute lecturer with the State Board, before advancing to her present position.*—EDITOR.

PURCHASING food supplies, and planning and preparing three meals a day in an economical manner is a problem at any time, and a serious one indeed when food is very costly. The problem of the woman on the farm differs from that of her city sister, inasmuch as the country woman is vitally concerned with the production of food as well as its use, while the city woman is directly concerned only with the purchasing.

The garden and orchard, the poultry yard, the dairy and the hog lot, are

all sources of food for the farm woman's pantry and storeroom. So in order to feed her family in the most economical and efficient manner, she should know how to make the best use of fruits and vegetables, how to care for meats, and how to look after poultry and dairy products.

Planning Meals

There is a popular belief that the farmer's family has better food and more of it than any other class of people. To be sure it has a better opportunity to have the right kind of food, since eggs, milk, fruits, and vegetables are usually plentiful, and these are the foods which should form an important part of our diet. It is true that the farm table usually sets forth abundant meals *but* not always are these meals well planned. However, the time has passed for farmers' wives to serve 3 or 4 kinds of meat, as many varieties of vegetables, and 2 or 3 desserts. We are beginning to realize the amount of time and energy expended in preparing these overloaded tables, the cost of these expensive meals, and, last but not least, the effect of overeating on the health.

Since women are in a large measure responsible for the health of their families, it naturally follows that they should know something of actual values of our standard foods. When women realize that balanced meals are most easily prepared, cost less, and are sure to result in better health, fewer families will be eating unplanned or, as they are called, unbalanced rations.

Many women have the idea that the scientific planning of meals means long, hard study. As a matter of fact, any average woman can learn the general underlying principles in a short time, whether she knows the scientific terms or not. The three principles have to do with:

1. **The functions of food which are:** (a) to furnish energy; (b) to build tissue; (c) to regulate body processes.

2. **The classification of foods into:** (a) *Proteins*, used to build tissue and to furnish energy; found in milk, cheese, eggs, lean meats, fish, beans, peas, lentils, cereals and nuts. (b) *Carbohydrates*, used to furnish energy; include all starches and sugars; found in cereals, such as oats, wheat, rye, corn, rice, etc., starchy vegetables such as potatoes and corn, and in sugars and syrups. (c) *Fats*, used to furnish energy; found in butter, cream, fat meat, lard, and oils, such as olive or cottonseed. (d) *Mineral salts*, which build bony tissue and aid body processes by furnishing materials necessary for digestion, circulation, etc.; found in fruits, vegetables and whole cereals. (e) *Water*, regulates body processes by: (1) Regulating body temperature; (2) dissolving the food for digestion; (3) carrying the food; (4) removing waste from the body.

3. **The amount of food necessary.** Although *protein* serves as an energy producer, its principal effect is as a tissue builder, and the amount used should be limited to 10 to 15 per cent of the total amount of food. Surplus protein overworks the body and is liable to cause intestinal putrefaction. *Sugar* furnishes quick energy, but ferments easily in the stomach. Limit the amount of sugar, therefore, to 10 per cent of the total food. *Starch*

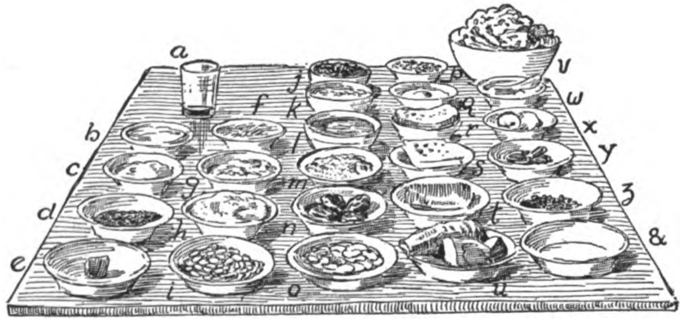


Fig. 143. A person requires from 14 to 24 calories or units of energy per pound of body weight. Here are portions of common food materials each representing 100 such calories: *a* olive oil; *b* gelatin; *c* corn-meal; *d* cocoa; *e* chocolate; *f* macaroni; *g* rolled oats; *h* cream of wheat; *i* navy beans; *j* spinach; *k* rhubarb; *l* cranberries; *m* stewed apples; *n* prunes; *o* lima beans; *p* shredded codfish; *q* egg; *r* bread; *s* crackers; *t* shredded wheat; *u* carrots; *v* lettuce; *w* banana; *x* onions; *y* dates; *z* raisins; *&* sugar. (Cornell Reading Course.)

FIG. 144. 100-calorie portions of milk products: *a* whey; *b* evaporated milk; *c* condensed milk (sweetened); *d* skimmilk; *e* whole milk; *f* 18-per cent cream; *g* 40-per cent cream. (Cornell Reading Course.)

makes up 50 to 55 per cent of the total food, and is the best form of energy for the body. *Fat* makes up 30 per cent of the total food; too much retards digestion and may produce nausea. *Mineral salts* should be provided for at every meal by including plenty of fruits and vegetables. Most people do not drink enough *water*. It is believed that plenty of water aids materially in digestion and helps in avoiding constipation.

In all well-selected meals a certain amount of indigestible bulk is necessary. Like livestock, we need "roughage." This may be obtained from *cellulose*, which is the woody framework of vegetables and fruits. Cabbage, celery, and lettuce are good "roughage" foods. Fruits and vegetables and milk furnish alkaline-forming elements which counteract the acid-forming foods, such as meat, eggs and cereals.

With this knowledge at hand, it is a simple matter for the housewife to plan well-selected meals by using the following suggestions:

1. Make a study of the principal foods and their value.
2. See that all 5 of the principal food classes are included in the right proportions at every meal; do not duplicate by using similar foods such as sweet and Irish potatoes, corn and corn bread, or a meat and meat salad.
3. See that the meal planned meets the needs of every member of the family. Children need plenty of milk, vegetables, cereals, and fruit; very little meat and sugar; and principally mild-flavored food. Adults engaged in active outdoor work require plenty of energy-producing food and can make use of coarser material than can people in inactive life. The aged require less protein, and an abundance of fruit and vegetables.
4. Understand thoroughly the correct method of cooking each food product, which conserves all the food value.

A skeleton outline, which includes the groups necessary for the daily meals, and examples of each may be developed, as follows:

Breakfast. Fruit (fresh, stewed or canned); cereal (oatmeal, cream and sugar); one hot dish (light meat or eggs); bread, butter; beverage (milk or coffee).

Lunch or supper. One principal dish (such as cold sliced meat, baked beans, or macaroni and cheese); one light vegetable (tomatoes) or vegetable salad; bread, butter; fruit or some type of simple dessert (apple sauce); beverage (milk).

Dinner. Soup or fruit; meat (cold sliced ham) or meat substitute; one starchy vegetable (potatoes); one light vegetable (green beans) or salad; bread, butter; simple dessert (fruit gelatin and cream); beverage (tea or milk).

Suggestions about Substitutes

Substitutes for meats. Many people eat too much meat. Health and economy both demand that we use the meat substitutes whenever possible. The composition of the following articles makes them well adapted for meat substitutes:

Milk, which is a real food and should be used as such. Skimmilk is a cheap source of protein supplied in a very digestible form. There is really no good substitute for milk, especially in the diet of children. It contains mineral salts and certain growth-promoting substances which are very valuable to children. Milk cannot be used weight for weight with other meat substitutes on account of the large amount of water it contains.

Eggs. Eggs should be more used in place of meat since they are easily digested, easy to prepare and very valuable for their growth-promoting substances. Too often meat and eggs are served in one meal. This is unnecessary. Vary the ways of cooking eggs instead of serving them in one or two ways repeatedly. Also serve in combinations with other foods as custards, cornbreads, etc. Like milk, eggs have no good substitutes. The number used in baking or in the making of custards may be decreased by the use of cornstarch and baking powder, bearing in mind that the food value of the dish is changed.

Cheese is a good substitute for meat since it is high in protein and fat. It is a concentrated food and must be chewed slowly and thoroughly. The method of preparation is important. When served in combination with other foods, it is more digestible. If cheese is heated to a high temperature as is often done in preparing baked dishes, such as rice and cheese, and macaroni and cheese, it becomes tough, leathery and indigestible. Serve cheese as the main dish rather than as a supplement.

FIG. 145. A day's food for a family of five: *a* milk (2 qts.); *b* beef (1 lb.); *c* eggs (2); *d* cabbage, *e* apples, *f* potatoes (total of the three, 4 lbs.); *g* bread (1⅓ lbs.); *h* sugar, *i* rolled oats (¼ lb.); *j* flour (1 lb.); *k* rice (½ lb.); *l* butter or other fat (¾ lb.). (Farmers' Bulletin 808.)

Cottage cheese is valuable as a source of protein but contains little fat. American cheese may be substituted for the expensive imported cheeses which are valued principally for their flavor.

Nuts make excellent meat substitutes since they, too, have both protein and fat. Peanuts, almonds, and pecans are especially high in protein. Nuts are concentrated food like cheese and should be finely divided and served in small quantities and in combination with other foods; for example, nut bread, cookies and nut rice loaf.

Beans and peas (including soy-beans and cowpeas) may be used in place of meat. Long soaking and long, slow cooking should be used in preparing legumes for table use.

Fat substitutes. Where the price of *butter* is prohibitive, there is no reason why *oleomargarine* should not be substituted. Where the feeding of children is concerned, care must be used in making this substitution, since butter contains substances which play an important part in children's growth and which oleomargarine, although a wholesome product, does not contain. This objection may be overcome by giving whole milk to the children.

When *lard* is high in price, it is necessary to find a substitute. Suet is comparatively cheap, but since it is of a hard consistency it is not used extensively in cooking. If 1 part of oil (cottonseed oil, corn oil, etc.) be added to 2 parts of suet, a good and satisfactory compound may be had at a reasonable cost. In summer, suet may be added to lard in small amounts to give a harder fat. In salad dressing, cottonseed oil may be substituted for olive oil, the food value being the same. If the flavor of olive oil is desired, use a small portion of olive oil with a large portion of the other oil. Buy all oils in quart or gallon receptacles to reduce their cost.

Potato substitutes. This vegetable is one of our staple products. When there is a shortage of this crop making the cost prohibitive, rice, hominy and macaroni may be substituted. Potatoes yield alkaline products in the body while cereals yield an acid product. Therefore, use other vegetables in abundance to counteract the effects when substituting these cereals for potatoes.

Breakfast foods. Where the cost of fuel is not to be considered, the home-cooked breakfast foods will furnish more nutritive value for the money than the ready to serve forms. Whole cereals furnish more food value than the milled.

Breadstuffs. Whole-wheat or graham flour can be substituted for white flour with advantage since both include a large portion of mineral which is omitted in the white flour. Cottonseed meal may be substituted in part for white flour but its content of protein is so high that it should be substituted for only one third the amount of white flour. Shorts also may be substituted for a part of the white flour in bread making, and cornmeal may be used alone or in combination with flour. Cornmeal contains a large proportion of protein which is incomplete but this lack is supplied if milk or eggs are used with it.

Fruits and vegetables are necessary to the diet and should be included frequently. In winter dried or canned fruits are cheaper than fresh products, and may usually be substituted for them. There is a tendency to cut down fruits and vegetables in the diet as their prices go up. This is a mistake; they are just as necessary as any other class of food.

The Preparation of Foods

The preparation of foods is rarely given proper consideration. There is a right and wrong way to prepare each food, yet we seldom see one housewife preparing all of them in the right manner. To be sure, this is the day of specialization, yet when women prepare 3 meals per day 365 days in a year, every kind of food is usually cooked. Just as far as possible all should be well prepared. It is as easy and cheap to make well-flavored, healthful coffee as poor-flavored, injurious coffee. In like manner, light, flaky biscuits require no more in their preparation than do heavy, soggy ones.

Each housewife should therefore endeavor to acquire skill in the various lines of cookery, rather than make, or in addition to making, a specialty of one. Most American families have pampered appetites due to eating rich and highly flavored foods. Our ideal in food preparation should be plain, wholesome, palatable foods prepared with care and skill. The following subdivisions in food preparation are discussed in the following pages:

(1) Bread, p. 185; (2) biscuits, leavening agents, p. 186; (3) meat cookery, p. 187; (4) soups, p. 191; (5) vegetable cookery, p. 194; (6) salads, p. 194; (7) egg cookery, p. 195; (8) beverages, p. 197; (9) cake making, p. 198; (10) frozen desserts, p. 200; (11) candy making, p. 201.

It will be noted that very few recipes are given. Housewives should learn the general proportions and make their own variations, and so be independent of the popular cook book which gives recipes only. For example, one good recipe for butter cakes may be used as a foundation for all other cakes in that class, and the memory does not have to be taxed to keep in mind the numerous cake recipes so much in vogue.

Bread Making

Many women find bread making a hard task. Yet if a few essential points are understood, bread making is easy and success is assured. The usual ingredients entering into bread are flour, yeast, salt, fat, liquid and sugar. The *flour* in most common use is a combination of the soft- and hard-wheat flours, but whole wheat, shorts, cornmeal and cottonseed meal, soy-bean meal, rye, barley, buckwheat, rolled oats, rice and potatoes may be used as partial substitutes. Either compressed *yeast*, dry yeast cake, or starter yeast may be used. Yeast consists of masses of tiny, colorless, oval-shaped plants which cannot be seen with the naked eye. Proper food, moisture and the right temperature are required for their growth. *Salt* is used to improve the flavor; one teaspoonful to a loaf is the correct amount, and more will prevent the growth of the yeast plants. *Fat* is added to improve the flavor and to make the crumb more tender, but it is not a necessary ingredient. For *liquid* water, milk, half water and half milk, potato water or whey may be used. *Sugar* improves the flavor of bread and also hastens the growth of the yeast plants; too much toughens the bread; use only one tablespoonful to a loaf.

Proportions for one loaf of bread

1 cup liquid	1 tablespoon fat
1/4 dry yeast cake or	1 tablespoon sugar
1/4 cup liquid yeast or	1 teaspoon salt
1/4 cake compressed yeast	3 to 4 cups flour.

There are two processes for making bread, as follows:

1. **Long-process** (sponge bread). (1) Scald the liquid. (2) Soften yeast (if in cake form) in 1/4 cup lukewarm water. (3) Add liquid to bowl containing sugar, salt and fat. (4) Cool and add yeast. (5) Add enough flour to make a batter. (6) Beat thoroughly. (7) Cover and let stand until light (at a temperature of 79 degrees F. or 26 degrees C.); let stand over night if desired. (8) Add remainder of flour and knead. (9) Place in clean bowl, cover and let rise to double its bulk. (10) Knead into loaves and place in pans. Let rise to double its bulk. (11) Bake 45 to 60 minutes at a temperature of 420 degrees F. or 220 degrees C., lowering the temperature the last few minutes.

2. Short-process. This is the same as the long method, except that all of the flour is added at once. Compressed yeast makes excellent short-process bread. Dry yeast cannot be used as the yeast plants must be in active growing condition.

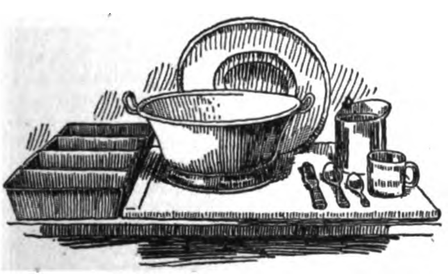


FIG. 146. Complete outfit for successful bread making.

The bread mixer is a great labor saver. Bread mixed and worked in this machine has a good texture and flavor, and the labor involved is much less. It is necessary to use the proper proportions of flour and liquid. The bread ingredients are added to the mixer in exactly the same manner as given in the directions for mixing the long-process bread. A sponge or straight dough bread may be made in the mixer depending upon the kind of yeast used. In adding the flour to make the dough, the crank is turned to mix it in thoroughly. Flour should be added until the dough does not stick to the sides of the mixer. Turn the crank 3 minutes after the ingredients are all in, then cover and set aside to rise. After rising, turn until the dough forms in a ball about the kneading rod. Remove the dough from the mixer and place in bread pans to rise.

Whole-wheat Bread

1 1/4 cups liquid	3 cups whole wheat flour or
3 tablespoons brown sugar	2 cups whole wheat flour and
1 1/4 teaspoons salt	1 cup white flour
1 pound fat	1/2 yeast cake

Heat the liquid, together with sugar, fat and salt. When lukewarm, add the yeast and flour; mix well and let it double in volume. Knead, put in pan, let rise to double its bulk and bake.

Shorts Bread

1 cup liquid (milk or water)	1/2 to 1/4 cake of yeast
1 tablespoon fat	2 cups shorts
1 tablespoon sugar	1 cup white flour
1 teaspoon salt	

Make a sponge, using the white flour. When this is light, stir in shorts, and proceed in the usual manner. Cottonseed meal bread may be made by using the above proportions, and substituting 1 cup of cottonseed meal and 2 cups of white flour for the materials given.

Cornmeal and Wheat Bread

1½ cups liquid (milk or water)	1 tablespoon fat
	1 cup cornmeal
½ cake compressed yeast	2 cups wheat flour
1½ teaspoons salt	1 teaspoon sugar

Soften the yeast in a quarter of a cup of the water. Cook the remaining 1½ cups of water, the cornmeal, salt, sugar, and fat for 20 minutes in a double boiler. Cool and add the flour and yeast. Let rise until it doubles its bulk. Make into a loaf, let rise again, and bake.

Biscuit Making and Leavening Agents

Every good housewife prides herself on having her bread and cakes light. The substances she uses to obtain this result are called leavening agents, and may be divided into three general types, namely, air, steam and carbon dioxide gas.

Air and steam. Air is introduced into doughs by beating or by adding to the dough beaten egg whites, in which a great deal of air has become entangled. Beaten biscuit, sponge cake, and omelet are made light by this process. Hot air has greater volume than cold air. When the material into which air has been introduced is placed in the hot oven, the small air cells increase in size, stretching the gluten in the flour or the albumen of the egg, and making the substance rise. As the dough becomes heated in the oven, the liquid in it is converted into steam. Steam has a very great power of expansion and stretches the elastic dough. "Popovers" and puffed pastry are good examples of the effect of this type of leavening agent.

Yeast. The earliest known leavening agent was yeast. While this name was not applied to it in the early ages, nor the process by which flour mixtures were made light understood as it is to-day, the method was similar. Bakers of the early ages and women in the home knew that dough or batter would undergo certain changes if left standing, and that a different kind of loaf would be produced. We know now that the reason why the flour and water mixture became light was because certain small organisms which are everywhere present in the air, grew in the mixture and lifted it as they gave off a gas called carbon dioxide. As the action of the ordinary yeast requires several hours, a more rapid leavening agent is often desired.

Sour milk and baking soda. Carbon dioxide gas is set free when sour milk and baking soda are combined. The scientific name for the substance that makes the milk sour is lactic acid, and the soda appears in chemistry books as bicarbonate of soda. (See Chapter 17.) Another practice familiar to many housewives is the use of soda and sorghum molasses which contains an acid.

Baking powders. While baking powder is to-day the most generally used leavening agent in the household, its discovery is comparatively recent. All baking powders have certain points in common: (1) They contain bicarbonate of soda and an acid in powder form, and upon the kind of acid used, depends the variety of baking powder; (2) they all contain a filling of starch which keeps the mixture dry; (3) carbon dioxide gas is given off from all the powders when they are moistened.

With reference to the acid principle they contain, baking powders are classed as tartrate, phosphate and alum powders. The acid ingredients used in tartrate powders are cream of tartar and tartaric acid; the former is found in ripe grapes, and the latter is derived from it. Cream of tartar is soluble in hot water but only slightly so in cold, hence dough containing tartrate baking powders can be kept for a short time before baking. The source of the acid ingredient used in phosphate pow-

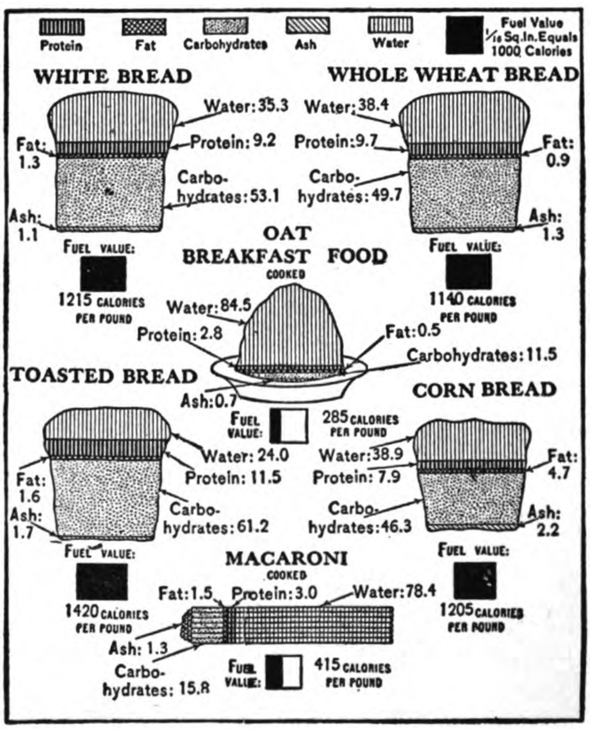


FIG. 147. Composition and fuel (energy) value in calories of some cereal products. This and similar charts on succeeding pages, prepared by C. F. Langworthy, Office of Experiment Stations, U. S. Department of Agriculture.

ders is ground bone or phosphate rock. The carbon dioxide gas escapes immediately after this powder is moistened, hence batters or doughs containing it must be hurried into the oven. The acid of alum powders is made from a kind of clay called alum ore. It is cheap, hence the powder is cheap. Many authorities hold that the residue left in the system by alum baking powders is harmful.

Some women prefer to make their own baking powders. To do so, carefully measure and mix 4½ pounds of cream of tartar, 2 pounds of soda and 2 pounds of starch.

Biscuit making. In making biscuits, the following ingredients are necessary: flour, liquid, fat, some rising agent, and salt. Pastry flour is best for biscuit making; bread flour contains more gluten and makes a tougher biscuit; the substitution of 2 tablespoons of cornstarch to each cup of bread flour used will make a good pastry flour. The liquid used may be sour milk, sweet milk, or water; the amount varies with the flour; hard-wheat, graham and whole-wheat flours require more liquid than soft-wheat flour; however, one third of a cup of liquid to 1 cup of flour is approximately correct. For fat, butter, lard or any of their substitutes may be used. Lard gives whiter biscuits than butter. One to two level tablespoons of fat for every cup of flour is the usual proportion. If sweet milk or water is used, baking powder is the rising agent, the usual proportions being 2 level teaspoons to 1 cup of flour; however, if desired, less baking powder may be added. When buttermilk is the liquid, add for each pint, 1 level teaspoon of soda. While these definite proportions are given, the housewife must vary the amount of soda according to the sourness of the milk.

Baking Powder Biscuits

3 cups flour	1 cup water or sweet milk
4 to 6 teaspoons baking powder	1 teaspoon salt
	1 to 2 tablespoons fat

Sift flour, salt and baking powder into a mixing bowl. (Never put the leavening agent into the liquid.) Add the fat (cold) and mix with spoon or spatula. If the hand is used, the fat may be melted and produce less flaky biscuits. Add the liquid, mixing as little as possible or gluten will develop, making tough biscuits. While the biscuits should be mixed just enough to handle, yet care must be taken not to have them too moist, as a hard crust will then form on the top and bottom. Roll to half an inch in thickness, cut to a small size and bake in a very hot oven.

Biscuits, if made properly, are as digestible as bread, although there is a popular belief to the contrary. Bread or biscuits, if soggy, will be hard to digest, since a doughy mass is formed which the digestive juices cannot easily penetrate. The dryness of toast and stale bread enables them to become more easily moistened and mixed with the digestive juices.

Biscuits should be small, light and flaky. Large biscuits are more liable to be soggy than small biscuits. The crust should be a light brown. This brown part is *dextrin*, and is formed when dry heat is applied to starch. It is more easily digested than starch, and gives toast its highly digestible quality. Small biscuits with a good crust have a good proportion of it.

Meat Cookery

Pork has been the principal meat used in the country home, but beef, which is more easily digested, is growing in favor. Most women are familiar with the different cuts of pork, but how many know the different cuts of beef and how to cook each to the best advantage? Often we find women buying high-priced meat and discarding all the cheaper cuts. This is a great mistake, as the cost of living can be reduced by making use of the cheaper cuts.

With a thorough understanding of the structure of meats, their cooking should be

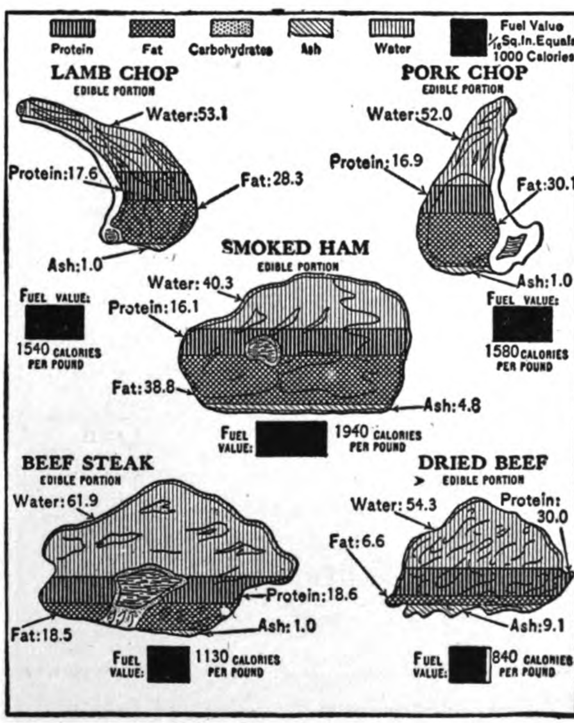


FIG. 148. Composition and fuel value of meats.

an easy problem. If a piece of boiled meat is examined it will be found to consist of long, stringy fibers. If these fibers could be seen under the microscope they would be found to be made up of tubes (muscle fibers) containing proteins, water, salts and extractives. To the extractives are due the characteristic flavors of meats; when they are removed, as when meat has been boiled a long time, the meat is tasteless. The flesh of young animals is not as rich in extractives as that of full-grown animals, so some add sauces and acids to give these meats a flavor. The fibers are held together by connective tissue made up in part of fat cells.

Meat is cooked to (1) develop flavor, (2) improve the appearance, (3) soften connective tissue, and (4) kill any living organisms that might produce disease. Tender and tough cuts of meat should not be cooked in the same way; yet we find many women buying high-priced, tender meat and spoiling it by cooking it as they would and should cook tough meat. Broiling and roasting are the preferred methods for cooking tender meats.

In cooking any meat our aim is to keep in the flavor and juices. To realize it the meat should be seared, regardless of the manner in which it is to be cooked. Searing means placing the meat in a very hot frying pan in which there is a small amount of fat, and turning it several times until the surface is browned and hardened so the juices cannot escape.

Steaks. Steak that is to be broiled should be cut at least 1½ inches thick and cooked over live coals, or in a frying pan. In pan broiling, which is a method used quite frequently, heat the frying pan very hot and sear the steak on both sides, then lower the temperature so the meat may cook entirely through. Turn frequently, using a spatula or cake turner instead of a fork; if a fork is used, some of the juices of the meat will be lost through the holes made by it. After it has been seared, and turned 3 or 4 times, a pan-broiled steak may be placed on the back of the stove or in the oven to finish cooking. Broiled steaks should be served at once. Place pepper, salt and butter in a hot platter, then remove the steak from the pan to the platter. Add the same seasonings on the top of steak, and garnish.

The best steaks are (1) porterhouse steaks; (2) sirloin steaks cut lower on the loin; and (3) round steaks, which are good if the animal is very fat and if the inside or top round is used. The outside or bottom round is less desirable. Many women ruin choice, tender steaks by dredging them in flour and frying them in lard.

Roasts. Roasting and broiling involve the same principles. The meat is seared in a roaster on a rack which holds the roast above the fat which cooks out. The fat side of the meat should be on top. If there is not much fat, skewer on an extra piece, or place strips of bacon on top. When this is done the meat bastes itself as the fat cooks out and runs down the sides.

The oven should be hot at first, then the temperature should be lowered. This hardens the outside, yet allows the meat to cook through without burning. Where water is added to a tender roast and the top of the roaster used the flavor and appearance of the roast is not as good. Every time a roast is basted with a mixture of fat and water, the crust formed by searing is dissolved, allowing juices to escape. For a tough roast, water is necessary, but the tender roast should be cooked by dry heat.

The rib roast (third and fourth ribs) is usually considered the ideal cut for roasting in an open pan with dry heat. The following table showing how the time of cooking varies with the kind and size of a roast, has been prepared

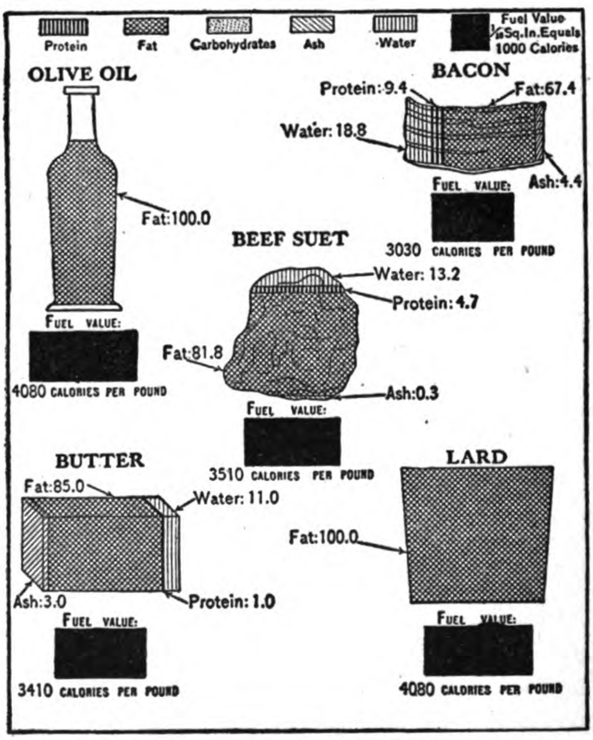
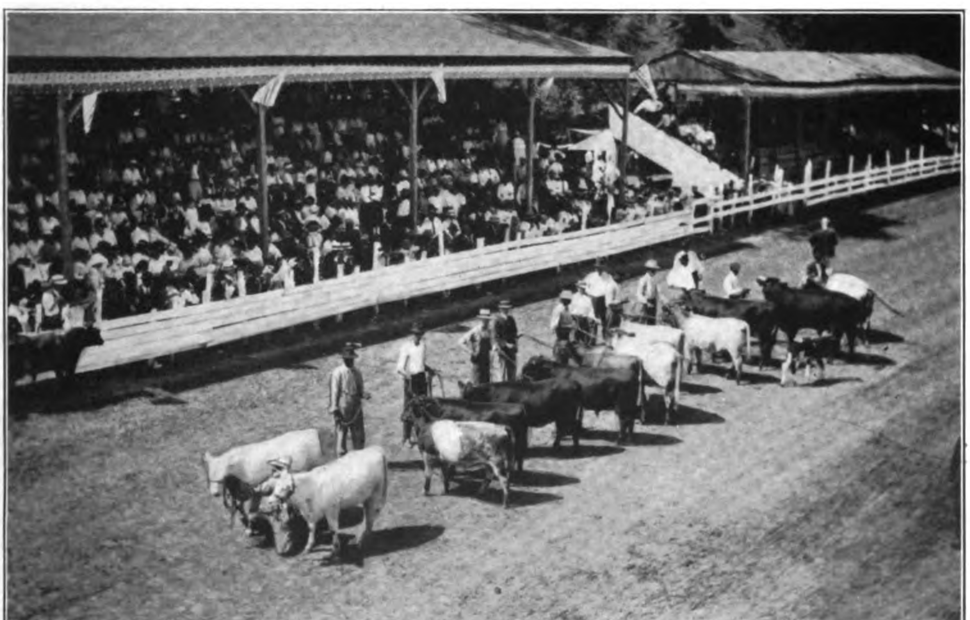


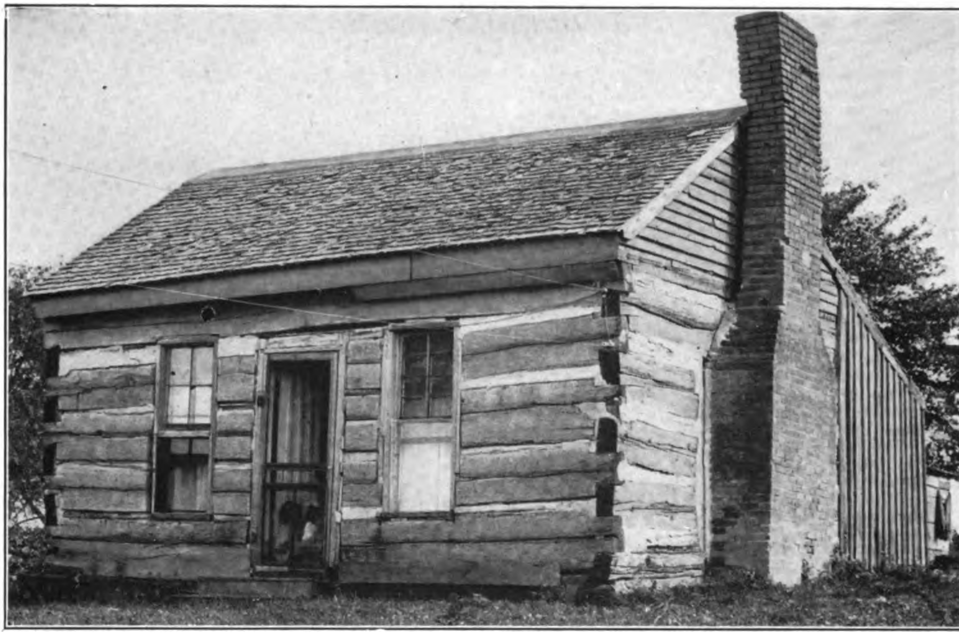
Fig. 149. Composition and fuel value of some common fat foods.

One rural community gets together for an annual fox hunt, with which is combined one of a series of farmers' institutes



Neighborhood livestock shows stimulate effort and local pride in the contestants and bring increased reputation and business to the community

ANY ACTIVITY THAT BRINGS THE MEMBERS OF A COMMUNITY TOGETHER WHETHER IN FUN, OR IN EARNEST, OR BOTH, IS A SIGN OF PROGRESS



This type of farm home, now to be found only in few localities, was a common sight when pioneer farmers were laying the foundations of the nation

Every farm home is also a place of business—but too many are only that and nothing more. Their profits should be measurable in terms of comfort as well as cash

BETTER FARMING MEANS NOT ONLY LARGER AND BETTER CROPS, BUT ALSO BETTER, HAPPIER HOMES

by Louise Stanley of the University of Missouri:

KIND OF ROAST	WEIGHT IN LBS.	TIME OF COOKING	TIME PER LB.
Rib (2 ribs)	8	2 hrs. 11 min.	16 min.
Rib (2 ribs)	9½	2 hrs. 45 min.	17 min.
Loin	12	2 hrs. 43 min.	13½ min.
Round (very thin)	3¾	39 min.	10½ min.
Round	6	1 hr. 9 min.	11½ min.

The tough, and therefore cheaper, cuts are found in that part of the body which does the most work; but often the flavor of tough meat is better than that of tender meat. The following methods of cooking tough meat are suggested:

FIG. 150. A steam cooker in which an entire meal can be prepared at one time.

Swiss steak. This method may be used for chuck and round steaks. Beat flour into both sides; this helps to break apart the fibers. Sear in a hot pan and cover with boiling water. Place cover on pan. Let simmer 35 to 45 minutes if a small steak, or 1 to 1½ hours if a large one. The pan may be placed in the oven and tomato juice may be added instead of water; onions also may be added. When ready to serve, the liquid should be of the same consistency as gravy. Add seasonings 15 or 20 minutes before removing from stove.

Hungarian goulash. Cut the meat (neck is often used) into small pieces. Dredge with flour and sear in a hot pan to which a small amount of beef fat has been added. Add enough hot water to cover, and place in the fireless cooker for 3 to 4 hours or cook in a slow oven for 3 hours. Vegetables and seasonings may be added about 45 minutes before removing from stove. If the gravy is too thin pour off and thicken.

Meat croquettes. Grind a tough cut of meat, season with salt, pepper, and onion juice, shape, roll in crumbs, dip in egg, and fry in deep fat.

Roast. A tough roast may be cooked in the oven at a low temperature, but the ideal way is to use the fireless cooker. Sear the roast, add boiling water, place top on roaster and cook several hours at a low temperature or place in the fireless cooker. Add seasoning about 15 minutes before it is done. Tough meats may also be served, after being cooked, in meat pies, scalloped, or hashed.

Points to remember. Remove meat from the wrapping paper as soon as it comes from the market, since the paper absorbs some of the juices. Wipe with a damp cloth; do not wash or let stand in a pan of cold water, as some of the juices will be dissolved. Keep in a cool place. Good beef is firm, with a fine-grained texture, bright red in color, with fat well distributed. Meat should have the seasonings added *after* it has been cooked, as salt tends to toughen it and to draw out the juices.

Soups

Soup making is an art and one which every housewife should find time to cultivate. Delicious flavors may be obtained by adding leftovers of all kinds. A great variety of soups is possible if time and thought are given to this subject.

There are two general classes of soups: (a) those having meat stock as a basis, and (b) those having milk or cream as a basis.

Meat soups. In making soup, if we are seeking the best flavor, we will look for a strongly flavored piece of meat. For instance, there is more than twice the flavor in a pound of round than there is in a pound of rib; there is 25 per cent more flavor in a pound of round than there is in a pound of sirloin; a hen makes more highly-flavored soup than a frying chicken would; veal soup has less flavor than beef soup, etc. Select, then, meat from an older animal. Include a bone, because there is much good flavor and fat in the marrow which we would get in no other way. The bone should be chopped so that the flavor can get out. The meat for the same reason should be cut into small pieces and enough meat and bone should be used to give the soup a really good flavor.

If we cut up a piece of meat and put it into cold water and let it soak, we get out considerable flavor and meat juice. However, as soon as this juice is heated, curds form in it; these rise to the top and we remove them in what we call a scum. Here is the main food value in the juice, but since it looks ugly and dirty we remove it. We can cook the meat tender and get the flavor out of it more quickly if we never allow it to boil. Added advantages of letting the meat simmer are (1) that what meat was in the soup does not get stringy and dry, and (2) that more of the flavor that was in the meat stays in the soup in place of floating off with the steam to all parts of the house. If the beef is real meat it can be used in some way where flavor is not important. Some people brown part of the meat to bring out the pleasant flavor. In this case put it into cold water for half an hour, then heat slowly and allow to simmer in a *covered* vessel for from 3 to 6 hours. Strain

if desired and allow the stock to become cold. A layer of fat will form on top. In a clear soup we want the fat removed, so we take off this layer of cold fat. To remove the small bits of protein which remain even after straining, we need to put in something that will gather them up so that we can strain them out. An egg, if used correctly, does this. If we heat the soup stock and then pour in the egg it will cook in chunks and will do no good. If we beat the egg a little and add it to the cold soup stock it mixes all through the liquid. As we gradually heat the stock the egg gradually begins to cook, and as it curdles it gathers up the fine protein particles. Then when the soup is strained, all the solid substance is strained off with the egg.

What have we left in the stock? We had flavor, fat and protein to begin with; we skimmed off the fat, we strained out most of the protein. We have left chiefly water and meat flavor or extractive. Most people have the idea that this meat flavor is very strong in food value, but actually it only tastes like meat; because it gives one a well-fed, satisfied feeling, most people think that it must be real food.

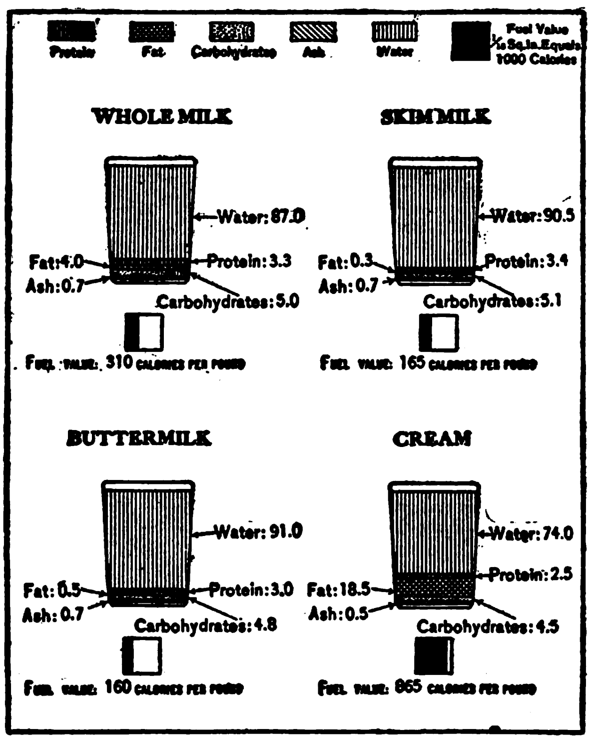


FIG. 151. Composition and fuel value of milk products. Compare Fig. 149

Why then do we use soup stock or beef tea or bouillon at all? They are expensive substances if we must buy 2 pounds of beef to make a quart of soup, which when done has no food value in it, and which wastes one or more eggs to clear it. The reason is that soups do stimulate the appetite. A clear soup served at the first of a meal smells good and tastes good, and "makes our mouths water," that is, makes the digestive juices flow more freely. That alone is a great value to us *if we follow up the soup with real food.*

Of the meat stock soups, *bouillon* is made from lean meats and vegetables delicately seasoned and cleared; *consommé* usually is made from two or three kinds of meat, highly seasoned and cleared. *Beef juice* from raw beef contains the liquid from the meat fibers. This is rich in flavor and food value, but if it is heated and strained the food value is strained off.

Milk or cream soups. These are made from vegetables or meat thickened until they are about as thick as ordinary cream. The amount of thickening will depend upon the starch contained in the vegetable. If it is a vegetable containing no starch, use 1 tablespoon flour to 1 cup soup. For potatoes use 1 teaspoon flour per cup of soup.

Potato soup. If we want 1 quart of soup or 4 cups, we will need 1 cup of diced potatoes. Cook these in 1 pint of water until they are tender enough to mash to a pulp. (Potatoes alone will not make a smooth cream of potato soup because the potato starch will settle and leave the soup thin at the top, so by the addition of just a little flour we hold the potato starch up so the soup will smooth.) Make a white sauce with 4 tablespoons butter or meat fat. Melt the butter, rub in the flour, let it brown a little to develop flavor, add the milk and potato water and mashed potatoes, also any other seasonings desired. This makes a smooth soup, which is nourishing because of the potato, milk and fat present. In making pea soup cook the peas in water, press through strainer, add milk; melt butter, add flour and combine with peas and milk. Cook together until thick.

Tomato soup. The twofold problem in making tomato soup is a little different. What causes tomato soup to curdle? How can this be prevented? It curdles because the acid of the tomato in the presence of heat acts on the milk, separating out its casein, or solid portion. Most housewives avoid the effects of the acid by adding soda to neutralize it, but this is

objectionable because it partially destroys the tomato flavor and it is hard to estimate the proper amount since some tomatoes are much more acid than others.

The curdling may be prevented by making a thin white sauce, using 1 tablespoon butter, 1 tablespoon flour and 1 cup of milk. Cook until it thickens and when cooled slightly add the tomatoes slowly, two thirds of a cup being a good proportion for this amount of white sauce.

Both milk and tomato juice should be at serving temperature when mixed. Pour the tomatoes into the milk, as a small amount of acid at a time in the milk will be less apt to form a curdle than a small amount of milk in a large amount of acid. Keep separate until ready to serve. If mixed and heated together, danger of curdling is increased.

Other soups. Some other non-starchy vegetables used for soups are celery, cabbage, onions, carrots, and turnips. The main points to mention in the use of these vegetables is the care to be taken in securing good flavor. Celery, tomatoes, and turnips are very delicate in flavor so that too long cooking in an open vessel makes them flat and tasteless. Cook mild-flavored vegetables in a covered vessel until just tender. The use of cabbage and onions is generally misunderstood. We are told that cabbage "liquor" is strong and not good, and that stewed onions are not desirable unless we pour off all the water in which they were cooked. If these vegetables are cooked rapidly in an open kettle and not cooked longer than is necessary to make them tender, water from them does not have a strong flavor but is quite delicate and appetizing.

The value of vegetable soups is mainly in the water from the vegetables. We have heard a lot of talk about the need of fresh vegetables and fruits to balance the diet. One reason for this is that vegetables and fruits furnish the mineral matter that "tones up" the blood, and balances that found in bread and meats. Much of this mineral matter cooks out into the vegetable water and we get it in the soup if we do not throw the water away and thus lose most of the good of our vegetables. Vegetable soups furnish a way of using vegetable water and scraps of vegetables which might otherwise be lost. Celery tops are good for making celery soup. Soups are economical means of using up liquid from vegetables and meats which would otherwise be lost.

Clear soups are valuable in the diet as appetizers, but have only a small per cent of food value. The food value ranges from almost nothing in the clear meat soups to considerable in the purees and bisques. From 15 per cent to 50 per cent of the mineral matter from vegetables comes out into the liquid in which they were cooked. Since this is the most valuable food substance in vegetables

USEFUL SOUP FORMULAS

FOOD	THICKENING	LIQUID
½ lb. soup meat	none	1 cup water
Tomatoes	1 tablespoon	½ cup tomato juice ½ cup milk
¼ to ½ cup potatoes	1 teaspoon	½ cup potato water ½ cup milk
¼ cup corn	2 teaspoons	½ cup water ½ cup milk
1 cup peas	2 teaspoons	1 cup broth
½ cup salmon	2 teaspoons	1 cup water

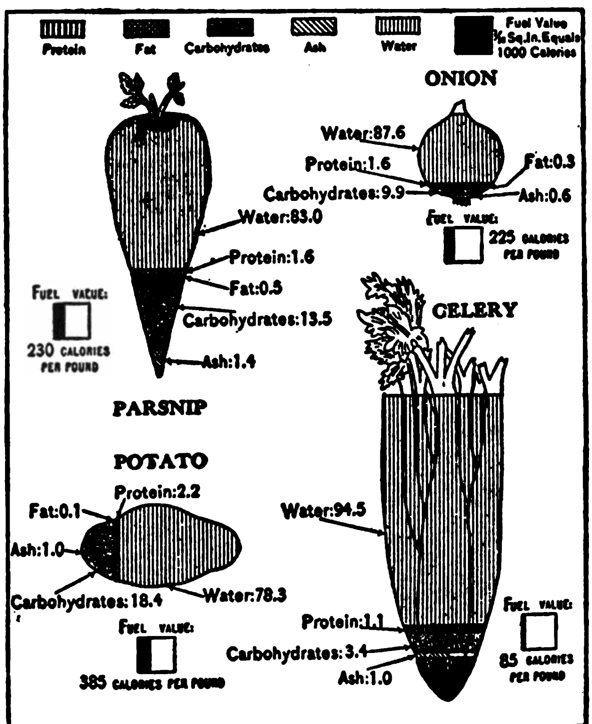


FIG. 152. Composition and fuel value of some vegetables. Most of these are valued chiefly for their mineral content

such as cabbage, onions, spinach, celery, etc., we are guilty of waste when we throw away the liquid. Flavor is destroyed or made less delicate by long cooking, so vegetables should be cooked until just tender; and soups should always be served hot.

Vegetable Cookery

Vegetables are cooked to make them more digestible and more palatable. They may conveniently be classified as follows: (1) *Roots, tubers, or bulbs;* examples—sweet potatoes, beets, carrots, parsnips, radishes. (2) *Underground stems;* example—potato. (3) *Stems;* example—asparagus. (4) *Leaves;* examples—cabbage, lettuce. (5) *Flowers;* example—cauliflower. (6) *Fruit;* examples—tomato, cucumber, squash, peppers. (7) *Seed;* examples—all legumes, grains.

The principal method of cooking vegetables is by boiling. Other methods are: baking, cooking in casserole, frying, sauteing and escalloping. Do not throw the water away in which vegetables are cooked except in the few cases in which the flavor is undesirable. Much of the valuable mineral matter is lost if this practice is followed.

The use of a greater variety of properly cooked vegetables in the diet is highly desirable. They contribute minerals which are necessary for the proper development of the body. There is no better way to get the various members of the family to eat more vegetables than by preparing them well.

Vegetable time-table. (For stewing and boiling unless stated otherwise.)

15 minutes: Tender cabbage and sweet corn. These are usually cooked too long.

30 minutes: Asparagus; peas; potatoes of medium size; summer squash; tomatoes.

45 minutes: Young beets and carrots; onions; young parsnips; medium-sized potatoes, baked; sweet potatoes boiled.

1 hour: String and shelled beans; cauliflower; oyster plant; winter squash, steamed or baked; young turnips.

2 hours: Old carrots, beets, and turnips.

6 to 8 hours (or more). Dried beans, lentils, and peas, baked in the oven, with water added.

Salads and Salad Dressing

Only recently has the housewife realized the importance of the salad as part of her daily menu. Now we find the dessert course omitted rather than the salad course. A good salad adds to the attractiveness of any table.

Salad dressings. There are 3 types of salad dressings—French, mayonnaise, and cooked dressing.

French dressing is made by mixing 2 to 3 parts of oil with 1 part of acid, the proportions differing according to taste. The acid may be vinegar or lemon juice, which makes a more delicate dressing. Instead of olive oil, any of the commercial salad oils may be used. These are less expensive and have practically the same food value. The seasonings are paprika and salt, although some add others such as pepper, mustard, etc. The following proportions are very good: 2 tablespoons of vinegar, or lemon juice, 4 tablespoons of olive oil; ½ teaspoon of salt, and ¼ teaspoon of paprika. Add the salt and paprika to the oil, then pour into the acid, beating all the time. French dressing may also be mixed by shaking the ingredients in a bottle. If allowed to stand, it separates and therefore should be well mixed just before serving.

Mayonnaise dressing. Egg is used in mayonnaise dressing and is the only difference in the ingredients used in mayonnaise and French dressings. It is difficult to give the proper proportions because individual tastes

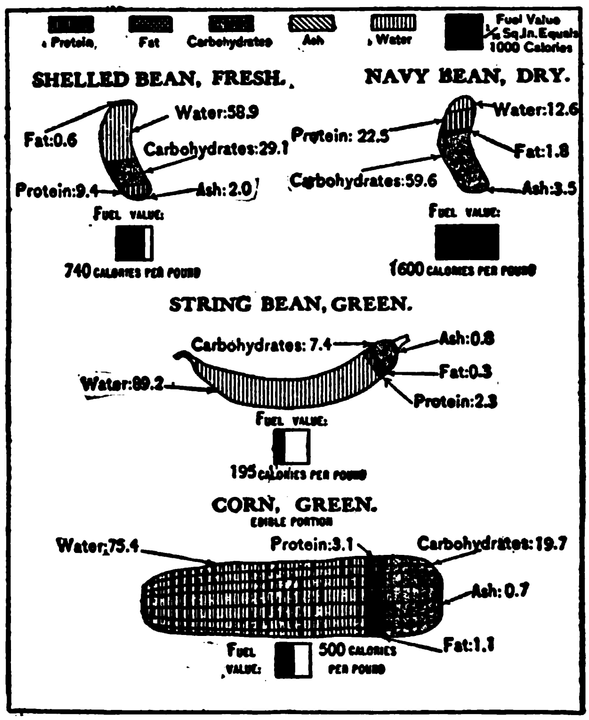


FIG. 153. Vegetables contain so much water that their food value is apparently low, but they should be eaten freely

differ greatly. One-fourth to 1 cup of olive oil may be used to 1 egg yolk, but the average amount is ½ cup of oil. Beat the egg yolk, add seasonings, then the acid and mix thoroughly. Into this mixture drop the oil slowly at first, beating constantly. When it begins to thicken, the oil may be added more rapidly. If too thick, thin with acid. While French dressing separates in a short time, mayonnaise will stand for a month if kept covered and in a cool place; if left uncovered it dries out. An average recipe is 1 egg yolk; ½ cup olive oil; 1 tablespoon of lemon juice (more if needed); 1 teaspoon of salt; ½ teaspoon of paprika.

Cooked dressings. There are 2 kinds of cooked dressing—one made from a custard foundation, the other from a cream sauce foundation.

Custard dressing: 4 whole eggs or 8 yolks; 1 cup of vinegar; 2 tablespoons of sugar; ½ teaspoon salt; whipped cream.

Heat the vinegar in the top part of a double boiler and pour slowly into the beaten eggs. Add the seasoning and cook the mixture over water till thick. When cool, thin with cream, either plain or whipped. This dressing is especially good for fruit salads, so no mustard or pepper is added. If fruit juices (lemon alone, or lemon and orange, or lemon and pineapple) are available, they may be substituted for the amount of vinegar given above.

White sauce dressing. This dressing is cooked directly over the fire, since the egg is not added till done. Melt 2 tablespoons of butter and stir into it 2 tablespoons of flour. Add ½ cup of water slowly, stirring all the time. Cook until thick, then add ½ cup of hot vinegar and cook quickly until very thick. Remove from the fire and add 1 or 2 whole eggs or 2 to 4 yolks. Season with salt, sugar, mustard and paprika as desired. This dressing is thinned as needed with cream or beaten egg white. It will keep indefinitely and is an excellent cooked dressing for meat and vegetable salads. It is more economical than the custard dressing and can be made even when eggs are expensive.

Salads. Salads may be divided into 2 classes—light and heavy. Typical examples of light salads are: Cucumber and tomato, asparagus and pimento, grapefruit and lettuce, cabbage and green peppers. Heavy salads have a foundation of meat, eggs, cheese, fish, potatoes, or peas.

The kind of salad served depends upon the remainder of the meal. If the meat and vegetable course is heavy, the salad should be light. On the other hand, a heavy salad may be used as the main part of the meal. No salad is complete without some salad plant, such as lettuce, water cress, celery tops, cucumbers, cabbage, or endive.

Salad points. (1) Salads should be cold and crisp. (2) Salads should be attractive; use colors which harmonize and flavors which blend. (3) Salad dressings, with the exception of French dressing, should be thick; always combine with the salad just before serving. (4) Materials for salads should be cut into pieces of uniform size but not too fine. (5) Bananas, apples, and pears may be kept from discoloring by dipping in lemon juice. (6) Garnishings should be dry, since water thins the salad dressing. (7) Salad plants will retain their freshness if wrapped in a moist cloth and kept in a cool place. (8) Egg yolk set aside for salad dressings will keep without hardening if covered with melted butter or water.

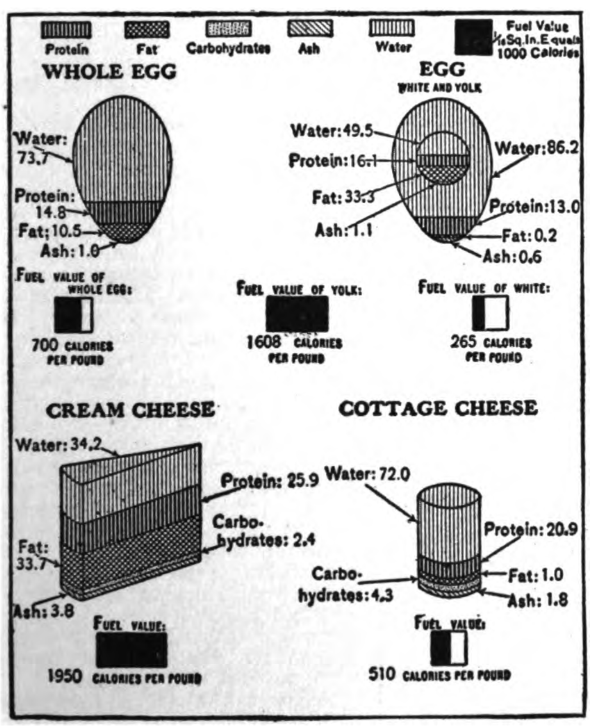


FIG. 154. Eggs (especially their yolks) and cheese are highly valuable, digestible and palatable foods

Egg Cookery

Eggs are rich in all those elements which enter largely into the construction of muscle, bone, and blood. In addition to their well-known high nutritive value they are very popular, since they are easily cooked in a variety of ways. Then, too, by mixing them with other foods, it becomes possible to make many modifications in texture, flavor and appearance of the other food materials. It seems strange that, since it requires only a little care, forethought and knowledge of the details to cook an egg correctly, we should find them cooked incorrectly in so many homes.

Soft-cooked and hard-cooked eggs. The fact that most people say "soft-boiled" and "hard-boiled" eggs, suggests that the right method is not used. We do not want to put eggs in boiling water and let them boil for so many minutes, for if we do, they will become hard, tough and leathery and as a result, difficult to digest. To soft cook an egg have the water just at the boiling point, drop in the egg and place on the back part of the stove, leaving for 4 or 5 minutes, the length of time depending somewhat upon the size of the egg and whether it was just taken from the ice-box. When the egg is dropped in the boiling water, the temperature is lowered almost immediately to 185 degrees Fahrenheit and then slowly to 170 or 171 degrees.

For hard-cooked eggs the same method is employed except that they should be cooked for 45 to 60 minutes at 180 to 190 degrees, in order that they may be mealy and not tough. Eggs put into hot water do not stick to the shell, and also cook more evenly than when put into cold water.

Poached eggs. To poach an egg is no easy matter, but a little care will bring good results. Some people poach their eggs by boiling them in a pan of water, having the water boiling when they are dropped in; other people drop the eggs in cold water and bring them to the boiling point. It has been found that the best method is to have the water a little below boiling. Pour boiling water into a shallow pan which has been brushed over with oil or butter. Break the egg carefully into a cup and slip gently into the water. The egg quickly reduces the temperature to about 185 degrees, which is correct for poaching. Let the egg cook gently and when a film has formed over the yolk and the white is firm, lift out with a ladle, drain, and place on a piece of hot toast. Put on a little piece of butter and sprinkle with pepper and salt and serve at once on a hot plate. When properly poached the egg is jelly-like throughout and the yolk is covered with a white film.

Fried eggs. Fried eggs, especially as prepared in many homes, are more difficult to digest than eggs cooked in any other way. A great deal of grease is put into the skillet and when it becomes smoking hot, the egg is dropped in and cooked at very high temperature. As a result it is very hard, tough and leathery and surrounded with a coat of fat. Instead, we should fry eggs as follows: Place a medium amount of fat in the pan, having it only slightly hot; then add the eggs and one teaspoon of water for each egg. Place a top over the pan to keep in the steam and cook at a very low temperature. When the eggs are done a film will cover the top as in the well-poached eggs (that is when we use the top on our pan).

Omelets. An omelet is an egg beaten very light, with a small amount of milk or cream sauce added. The best method is to beat the whites to a stiff froth, then beat the yolks; add pepper and salt, and milk or cream sauce. Vegetables, such as peas, peppers, asparagus, and onions, may be added after being thoroughly mixed with the yolks. Fold in the whites very gently so as not to break the air cells. To 1 egg, 1 tablespoon of milk may be added, but more makes it too thin, unless in the form of a cream sauce, of which from one fourth to one third cup may be used. After the whites and yolks are blended, place in skillet slightly greased and cook at very low temperature; be careful not to let it get too hot on the bottom. When it becomes firm place on a plate and fold one-half over. A fallen, soggy omelet usually results when it is not cooked slowly enough and when not cooked throughout.

Sponge cake and angel food cake may be considered as variations of an omelet. In these we should be very careful in mixing in the beaten

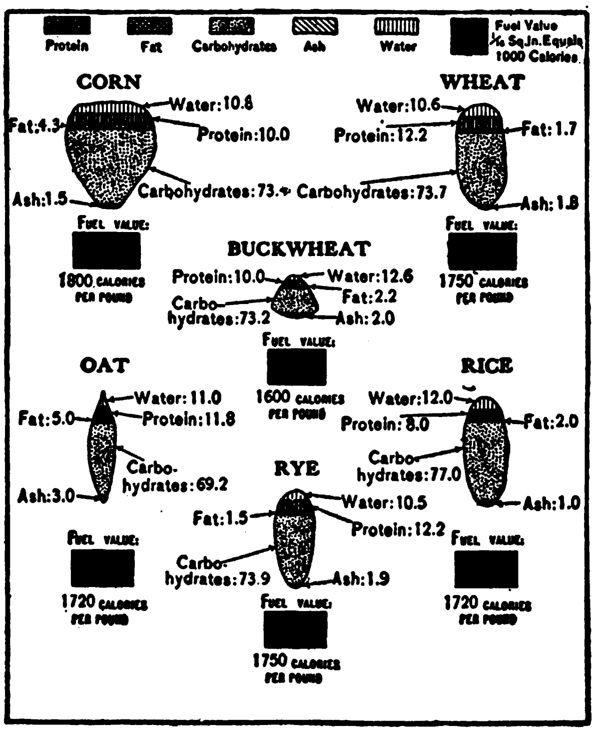


FIG. 155. Grains are robbed of much of their most valuable food materials by too great refining in the milling

egg whites, not to break the air cells, and we should watch our oven that we do not have it at too high temperature. For a large loaf the oven should be about 150 degrees and at the end should be brought up to 180 degrees.

Custards. Eggs play an important part in custards. Here also the egg should be cooked below boiling. Where cornstarch is substituted for part of the egg, the starch (which should be boiled) should be cooked in the milk before the egg is added. A very good way to keep a baked custard from cooking at too high temperature is to place the baking dish in a pan of water.

Beverages

Coffee. To make good coffee it is necessary to extract the flavoring elements and avoid the extraction of the element called caffein, either by long boiling, or by allowing the liquid coffee to stand on the grounds after it has been boiled. The flavor also is lost by long standing.

There are four general methods of making good coffee: (1) The cold-water method, (2) dripping, (3) boiling, and (4) percolating.

Cold-water method. Probably the best way to make coffee is by the cold-water method. Place the coffee in the desired amount of cold water and let stand over night. In the morning bring to a boil and serve at once. Usually 1 to 1½ tablespoons of coffee are used per cup.

Drip coffee. Various coffee pots are sold for making drip or filtered coffee, but the principle is the same in all. The coffee is put into a strainer, the boiling water is poured through it and allowed to collect at the bottom of the pot. If the liquid is not strong enough it may be poured through the grounds a second time, the pot being kept in a warm place. Coffee must be ground fine for drip coffee.

Boiled coffee. Use 1 cup of ground coffee, 1 cup of cold water, 6 cups of boiling water, and 1 egg white. Beat the egg, add ½ cup cold water, and mix with coffee. Put this in the coffee pot, pour on the boiling water and stir thoroughly. Boil 3 minutes, then add the remaining ½ cup of cold water. Cold water is heavier than hot water, and sinks carrying the grounds. This as well as the egg helps to clear the coffee. Set in a warm place 5 or 10 minutes, and serve.

Percolator coffee. There are several kinds of percolators on the market, but in all of them the water boils in the pot and passes through the coffee at boiling temperature. At no time in the process does the coffee stand on the grounds.

Ground coffee is often adulterated with chicory root which has been washed, sliced, dried and roasted. A small amount of chicory added to coffee makes the infusion appear a dark brown. The addition of chicory is a fraud on the consumer, and it may also prove injurious. If ground coffee is dropped into a glass of cold water the genuine coffee will float and will not discolor the water for several minutes. Most adulterants sink to the bottom, leaving a brown trail in the water. The careful housewife always grinds her coffee at home or watches her grocer while he grinds it. Coffee should be bought in small quantities and kept in airtight receptacles so the flavor will not be lost.

Tea. The careful making of tea is as important as that of coffee. The tea leaves should be allowed to come in contact with hot water only long enough to extract the volatile oil and some of the tannin. Tea never should be boiled. Many women boil tea 10 to 15 minutes, and then allow the portion not used to stand until the next meal. The bitter taste of iced tea in many hotels and restaurants is often due to the fact that

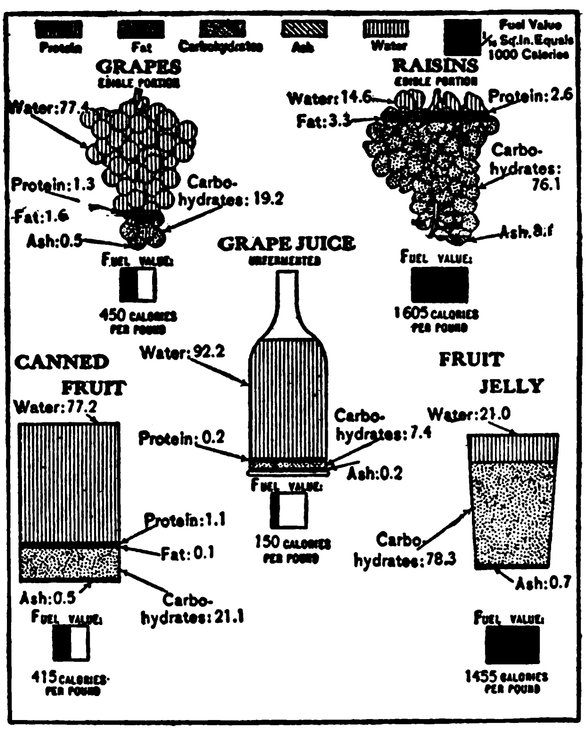


FIG. 156. Fresh fruits and their juices are refreshing rather than sustaining. Raisins are rich in iron and other minerals

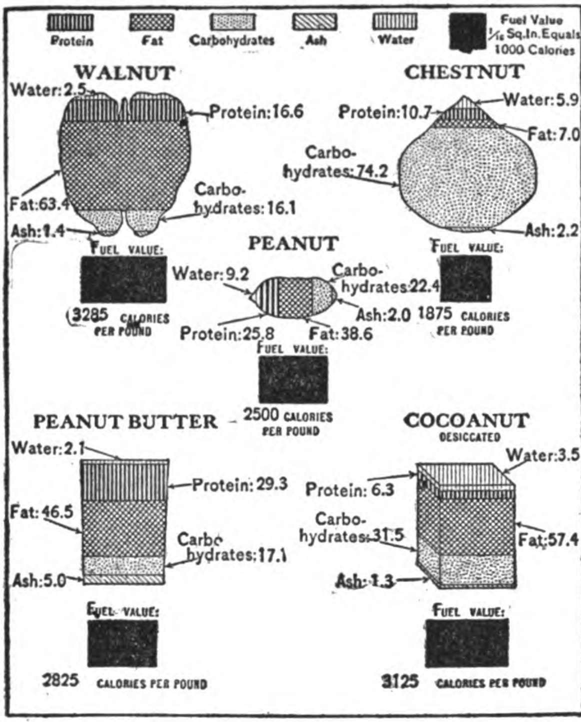


FIG. 157. Nuts require thorough grinding or chewing if their full value is to be obtained

the tea leaves were boiled, allowed to stand in water from one meal to another, and then boiled a second time before serving.

In the preparation of tea, hard water should be used. Soft water extracts a bitter principle from the leaf. Water boiled a long time becomes "flat"; so the water used for tea should be freshly boiled. To make the tea, scald an earthenware or china tea pot; put in the tea leaves (3 teaspoons to 2 cups of water is a good proportion) and pour on the boiling water; set in a warm place 5 minutes; strain and serve immediately. Sugar, cream or lemon may be added. Never add fresh leaves and steep a second time. Too much tannin will be dissolved.

The "tea ball" is now being used extensively. Usually about 1 teaspoon of tea is placed in it and held in the cup of hot water until the infusion is of the desired strength.

For iced tea use 4 teaspoons of tea and 2 cups of boiling water and make in the usual way. Strain into glasses one-third full of cracked ice. The flavor is improved by chilling the tea quickly. Sugar and lemon are usually served with iced tea.

Cocoa and chocolate. These are both prepared from seeds of the cocoa bean. Cocoa consists of chocolate from which the fat has been removed, and which has been mixed with sugar, starch, and flavorings. Many persons drink cocoa because it is not as rich as chocolate. The action of cocoa and chocolate on the nervous system is much less than that of tea and coffee, and they may be regarded as foods as well as stimulants.

Cocoa. Use ¼ cup cocoa; 1 cup water; 3 cups milk; ¼ cup sugar. Mix cocoa, sugar and water together and boil for 10 minutes. Add milk, heat to boiling point and remove from heat. Beat with an egg beater.

Chocolate. Use 2 squares chocolate; 1 cup boiling water; ⅓ cup sugar; 3 cups milk; flavoring. Melt the chocolate, add the sugar and then add the water. Boil for 10 minutes, add milk which has been heated in double boiler, and remove from heat. Beat with egg beater.

The influence of all these beverages may be considered, on the whole, as unfavorable. Coffee and tea cannot be considered as foods, but as stimulants. Children never should be allowed to drink coffee; but cocoa and chocolate, when served in small portions with large amounts of milk, may be given to them. They are much used by invalids. Coffee removes the sensation of fatigue, allays hunger and stimulates the heart action. The coffee habit often is developed by using the beverage to aid one in keeping awake or in doing extra amounts of work. Insomnia and dyspepsia may result. Tea is also a stimulant, and often relieves fatigue. It should be avoided by any one suffering from dyspepsia or constipation.

Cake Making

Every cake may come up to the standard if the housewife understands and puts into practice the principles of cake making. If she knows these principles she will get good results from any reliable recipe, and she will also be able to tell at a glance when a recipe is incorrectly proportioned.

Used in a broad sense, the word cake includes those loaves made with yeast and allowed to rise before baking. In its more restricted meaning, it comprises loaf and layer cakes made by some other method. From the standpoint of composition, sponge cake really groups itself with omelets (p. 196), so will not be discussed here. Only cakes made with fat will be considered.

The ingredients essential for cake are flour, liquid, sugar, egg, fat, and baking powder.

Other ingredients such as nuts, spices and flavorings are added for the sake of variety.

There are 2 kinds of flour: *bread flour* or hard-wheat flour made from wheat sown in the spring, and *pastry flour* or soft-wheat flour made from wheat sown in the fall. Pastry flour differs from bread flour in that it contains less gluten and more starch; it is smooth to the touch, packs easily, and retains the impression of the fingers when pressed in the hand. Bread flour, on the contrary, does not pack and is granular to the touch. Pastry flour makes a lighter and more tender cake and is preferable for cake making. If only bread flour is to be had, it is well to substitute 2 tablespoons of cornstarch per cup of flour in place of the same amount of bread flour. Always sift flour twice before measuring; fill the cup by lifting the flour lightly into it, rather than by dipping the cup down into the flour.

Fat is used to make the cake more tender, by keeping the particles separate. While butter gives the most desirable flavor, other fats may be used in cake making, especially in dark cakes; but since butter is only 85 per cent pure fat the substitutes cannot be used in equal proportions. The equivalents of two thirds of a cup of butter are approximately: Lard, half a cup plus 1 tablespoon; Crisco, half a cup plus 1 tablespoon; chicken fat, two thirds of a cup. (Half a teaspoon of salt should be added to these fats.)

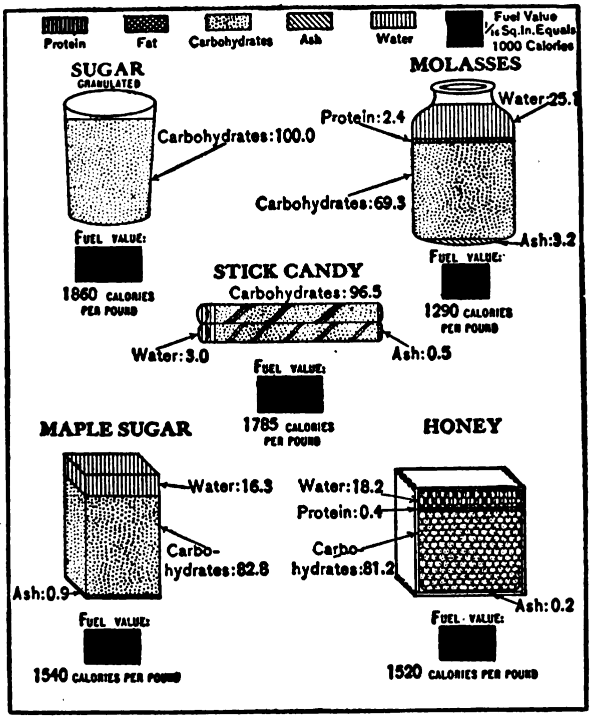


FIG. 158. Candy and other sweets should be eaten as part of the daily ration, not in addition to it

Fine granulated *sugar* should be used, as coarse sugar gives a coarse texture.

The *liquid* generally used is milk, but when necessary, water may be substituted. Since the composition of milk is about one eighth solid material, seven eighths of a cup of water equals one cup of milk. The amount of liquid required will vary since different grades of flour absorb different amounts of liquid, while the same grade will often absorb more at one time than another.

Eggs have the effect of making the particles stick together. If the amount of egg is increased, the amount of liquid may be decreased, since egg behaves as a liquid when added to the batter. One beaten egg white is the equivalent of about half a teaspoon of baking powder. Hence, as the egg whites are decreased the baking powder must be increased.

Learn to make one cake well and vary it by changing the form and flavors. A good formula for a plain white cake is: Flour, 3 cups; baking powder, 3 teaspoons; butter ⅜ cup; sugar, 1½ to 2 cups; milk, 1 cup; whites of eggs, 4 to 6; flavoring. When we consider the long list of spices and extracts, fruits and nuts available, we see how it is possible to make many kinds of cake on one such foundation.

The following suggestions are offered by a New York (Cornell) bulletin: (1) *Chocolate* contains both starch and fat; hence, when chocolate is added to the plain foundation, less flour (1½ cups chocolate equals 2 tablespoons of flour) and less fat are required. (2) When *nuts* are added, less fat is required, since 1 cup of nuts equals 1 to 2 tablespoons of fat. (3) A *fruit cake* requires a rather stiff batter; otherwise the fruit will fall to bottom of pan; ordinarily, if the fruit is well floured, a sufficient amount will thus be added. (4) When *spice* is added, scald it to insure more thorough mixing and better flavor; a good mixture is 1 teaspoon cinnamon, ½ teaspoon cloves, 2 tablespoons hot water.

Making cake. Collect all utensils and ingredients before beginning to mix cake. Then measure all ingredients to be used. The cake may be mixed either the old or the new way. (a) If using the old method, cream the fat and sugar; add flour and baking powder alternately with liquid; fold in the well-beaten

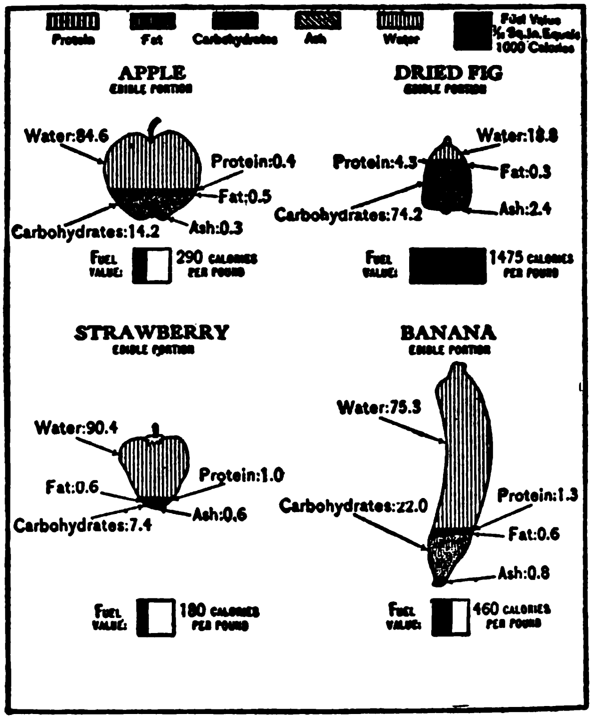


FIG. 159. Fruits have a beneficial effect on the digestive system in addition to their value as food

whites of eggs. (b) In the new method, put liquid and melted fat into mixing bowl; sift in dry ingredients—flour, sugar and baking powder—and mix thoroughly; fold in the well-beaten egg whites; oil pans and dust lightly with flour. If the pan is rough, place paper on the bottom; put batter into pans (filling two thirds full); with a spoon or spatula bring the batter toward sides of the pan, leaving center lower than at sides.

The oven is a very important factor in cake making. The insulation is the important part and the keeping of a definite temperature a given length of time depends upon its perfectness. Cakes are very often spoiled by uneven temperatures. An oven that will turn a piece of white paper golden brown in 5 minutes is a good layer cake oven. Loaf cakes require an oven of a slightly lower temperature. A cake is thoroughly cooked when it shrinks from the sides of the pan and rebounds to the touch of the finger. When cake is removed from oven, let stand a few minutes, then turn out on a wire cake cooler.

Causes of cake failure. (1) Too little flour makes cake fall because there is not enough gluten to stiffen it and hold it up; too much flour makes cake crack open. (2) Too little sugar makes cake bread-like; too much makes it fall and gives a moist, sticky crumb and a sugary crust. (3) Too little fat causes cake to crumble; an excess makes it heavy. (4) Too much liquid makes cake undersized and the texture porous. (5) If oven is too hot, the cake cracks; if too slow, the cake rises, but soon falls.

Icing. When well made this increases the palatability and attractiveness of cake. By helping to retain the moisture of the cake it also adds to its keeping quality. To make it, boil 1 cup of water and 1½ cups of sugar very slowly until the syrup threads. Do not stir while cooking. Pour slowly into the well-beaten whites of 2 eggs, beating constantly. Continue beating until the icing is cool and stiff enough to spread on the cake. This frosting is delicious with nuts and fruits added. A cup of blanched almonds, pounded to a paste, or a cup of hickory nut or pecan nut meats, chopped fine, makes an excellent nut filling. Chopped figs, raisins, and nut meats mixed together are rich and delicious with this frosting. For chocolate frosting add 2 squares (or 2 ounces) of chocolate before cooking, or melt the chocolate and add after beating.

Frozen Desserts

With a farm supply of ice, frozen desserts are easy to make and not expensive. Furthermore, our diet will be improved when we cease to think of ices and ice creams as belonging to the occasional "company dinners," and use them more often in place of hot, rich puddings and pastry. Some people claim that ices and ice creams are unhealthful. This is probably because they are usually eaten too fast. Then, too, some people eat too much ice cream; they do not realize they are getting a real food. Again, these frozen foods are eaten at all hours and after sufficient food has already been taken. Ice cream, owing to its high food value, belongs with a light meal, while the fruit ices, which are not so rich, may be added to the heavier meal.

Ices. Water is the foundation of ices. A plain ice calls for water, sugar and fruit juice. Fruit pulp may be added to it. Dissolved gelatin may also be added with or without the pulp, as may also beaten egg white (when ice is partly frozen). Finally milk or cream (sweetened) may be added to give more body and richness. Lemon should form the basis of all ices. All ices should be made of a syrup of sugar and water. Boil the sugar and water

slowly for 10 minutes; remove from heat, add fruit juices or thoroughly crushed, sweetened fruits, and cool; freeze. A recipe for making raspberry ice, which may be used as a basis for all ices, is: 4 cups water, 1¾ cups sugar, 2 cups raspberry juice, 2 tablespoons lemon juice. Make a syrup by boiling the sugar and water 10 minutes; cool and add the raspberries, which have been mashed and run through a sieve; add lemon juice and freeze. Remove, cool, and add the cream. Freeze.

Iced beverages should be given an important place in our menus during the summer months. The following recipe is useful: *Lemonade.* Make a syrup by boiling 1 cup of sugar and 2 cups of water very slowly for 10 minutes. Remove from stove, add one-third cup of lemon juice, and cool. Dilute with ice water according to individual taste. Lemon syrup may be bottled and kept indefinitely. This method is not only a great convenience but less sugar is required and a more delicious beverage results. Lemonade made of lemon juice and orange juice rather than lemon juice alone, is preferred by many.

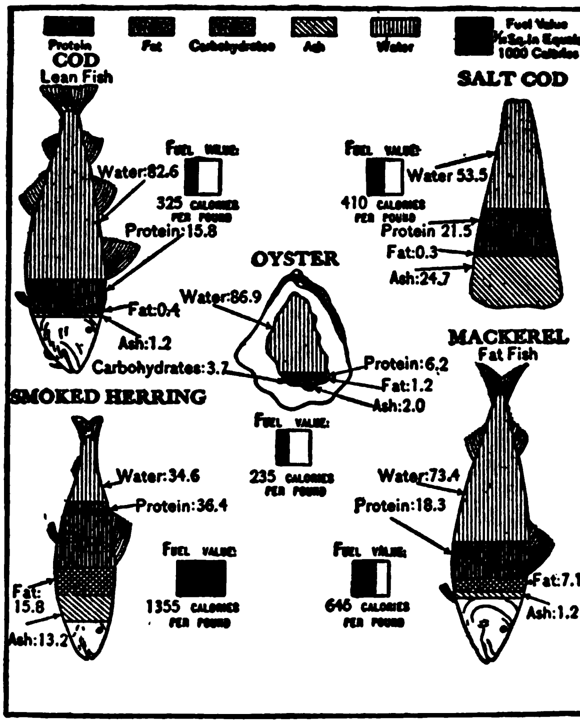


FIG. 160. Fish have less energy value than meats, but provide a very valuable variety

Ice creams. Milk or cream is the foundation of ice cream. Plain ice cream uses cream, sugar and flavoring. To vary it, add dissolved gelatin, flour or corn starch, beaten egg yolks (when partly frozen), whipped cream or beaten egg white, or soft custard. To any of these may be added any flavoring, fruit juice or juice pulp well sweetened. Fruits should be thoroughly crushed and sweetened.

Plain ice cream. The simplest type of ice cream is made by combining sugar, cream and flavoring. Usually 1 cup of sugar to a quart of cream is used. Dissolve the sugar by heating it in a small portion of the cream. Add the remainder of the cream to which flavoring has been added, and freeze.

Custard ice creams. Too often we find milk, sugar and eggs combined and frozen without first being cooked. These same ingredients, if used correctly, make delicious ice creams. Make a custard of eggs, sugar, and milk and add an equal proportion of cream, then freeze. This type of custard cream is especially desired when the housewife's supply of cream is low. One quart of milk, 4 eggs, 2 cups of sugar and 1 quart of cream are the usual proportions. Cook eggs, sugar and milk in a double boiler.

Strawberry ice cream. Wash and stem 1 quart of berries. Sprinkle with ½ to 1 cup of sugar, depending upon the sweetness of the berries. Let stand one hour. Mash and rub through a strainer. Make a custard of 1 pint of milk, 2 eggs and 1 cup of sugar. Cool and add 1 pint of cream. Partially freeze; add berries, and finish freezing.

Freezing. Use 3 parts of crushed ice and 1 part of salt. Mix the salt and ice thoroughly before adding to the freezer.

There is a hole in the wooden part of the freezer—this is to let out the salt water. Some people make the mistake of putting a hole in the freezer down toward the bottom so that the water will run off. This is a mistake for the salt water is the coldest substance around the cream. It takes the heat out of the cream much better than air spaces between the ice would. Therefore, save the ice water, just so it does not get high enough to get into the cream. If rock salt is used, it may be saved from each freezing and used again.

The Principles of Candy Making

Candies are divided into four general classes: (1) brittle, (2) crystallized or cream, (3) non-crystallized, and (4) texture. With a few exceptions, in which confectioners' sugar

is used, cooking is a part of the process of candy making. When no liquid is added in heating sugar, we have *brittle candy*. The sugar is melted over the fire in a pan, being stirred constantly to prevent burning. It may be poured over peanuts, cocoanut, or other nuts, in a buttered pan or platter.

Crystallized or cream candies which make up by far the larger group, comprise those made by heating water and sugar. Fudge and fondant are examples of this class.

Non-crystallized candies include butterscotch, caramel and taffy.

Cream candy added to egg-white, gelatin or gum arabic, is classified as *texture candy;* divinity and marshmallow are examples of this kind.

Fondant. If one understands the principles of making fondant, other candies are more easily made. Fondant is the cheapest of all homemade candies and the foundation of many kinds; also it is easily made. To make fondant, add 1½ cups of water and ¼ teaspoon of cream of tartar to 5 cups of sugar. Stir until the sugar is dissolved but no longer. Cook slowly to the soft-ball stage (238 degrees F., or 113 degrees C. See accompanying table) continually wiping down the crystals from the sides of the vessel with a damp cloth wrapped around a fork. When done, pour the sirup on a platter. When cool enough to allow the finger to be held in it, stir with a wooden spoon until it creams. Then knead till smooth. Wet and wring a small towel, place it over the fondant, and allow it to remain there for an hour; this is called the curing process. One of the good points of fondant is that it does not become stale; in fact, it improves when kept for some time.

For cinnamon balls, shape the fondant and roll in powdered cinnamon. For caramel creams, flavor with caramel. This flavoring can be made by melting sugar, then adding water, and cooking until it becomes a thick sirup. For chocolate creams, melt chocolate and dip in the cold fondant which has been shaped.

Fruits and nuts are especially good when dipped into melted fondant. White grapes treated in this way give a dainty touch to a box of candy.

Fudge may be made as fondant. When the sirup is placed in a platter to cool, cut the chocolate in small pieces, and add to the sirup. It will melt, and when beaten produces a delicious fudge.

Texture candy. To make divinity candy, use 3 cups of sugar, 1 cup of water, and ¾ cup of sirup. Cook until it forms a hard ball (248 degrees F., or 120 degrees C.). Pour it into the well-beaten whites of 3 eggs. Add 1 cup of nuts and beat until creamy. Shape into long loaves and place on a plate over which cold water has been poured, leaving the plate wet. Do not use butter, as its flavor is not desirable in this kind of candy.

Non-crystallized candies. These may be divided into 2 groups: those which are to be pulled and those which are not. Butter scotch and caramel, which require no pulling, and taffy, which is pulled, are representative of this class. To make butter scotch, use 1 cup of sugar, ¼ cup molasses, 1 tablespoon of vinegar, 2 tablespoons of boiling water, ½ cup of butter. Boil ingredients together until the mixture will become brittle when tried in cold water. Turn into a well-buttered pan. For taffy, the following proportions give excellent results: 2 cups sugar, ½ cup of vinegar, 2 tablespoons of butter. Boil until the mixture will become brittle when tried in cold water. Turn on a buttered platter to cool. When cool enough to handle, pull.

TESTS FOR CANDIES, WITH CORRESPONDING TEMPERATURES

STAGE	TEMP.	SIRUP TEST
Thread	230 F. 110 C.	Forms a thread when dropped from a spoon
Soft ball	238 F. 113 C.	Forms a soft ball when dropped into cold water
Hard ball	248 F. 120 C.	Forms a hard ball when dropped into cold water
Crack	290 F. 143 C.	Becomes brittle when dropped into cold water
Hard crack	293 F. 155 C.	Becomes very brittle when dropped into cold water
Caramel	360 F. 175 C.	Changes color and becomes very hard and brittle when cool

Serving Meals

It is not necessary for any housewife to burden herself with an attempt at elaborate table service, but it is necessary that attention be given to the dining room, the table and the food, in order that each may be made as attractive and pleasant as possible for the sake of the effect upon the minds and digestions of the members of the family. We easily understand how largely the appearance of our food and its service affect our appetite when we contrast a fresh, sunny room, clean table linen, a well-laid table and simple, well-

cooked fare with a stuffy room, a soiled cloth, dishes set awry and a general effect of flies, dust, and soggy, greasy food.

A certain amount of ceremony is desirable in table service, not only for its effect upon the adults, but for the training of the children in table manners. If time is taken each day for conversation at the table, for the proper serving of food, and for the observance of those niceties that we call "manners," there will be no awkwardness and no embarrassment when "company" comes. Girls who are our future homemakers should understand thoroughly the principles of good service even though it may not be practicable to use all of them every day. Every girl in her own home should consider it an accomplishment to serve for her mother without the assistance of a maid, and the mother who does not train her daughter thus is not doing her duty, for at some time in every girl's life she will feel the need of such training.

Setting the table. 1. The dining room should be kept scrupulously clean and neat. It should be well aired and the shades at the proper height.

2. Lay, first, the silence cloth, which may be made of canton flannel, an old blanket, or the regular padding sold for the purpose. It is used to prevent noise, to protect the table, and to make the tablecloth lie smooth.

3. The tablecloth should be large enough to cover the table and fall from 10 to 12 inches below the edge. A cloth which is too large is more expensive, harder to launder, makes an untidy appearance, and is in the way. Lay the cloth straight and smooth with the middle fold lengthwise down the center. When laundered, table cloths are often rolled on a round stick made for this purpose, which does away with all creases.

4. No table is really complete without some decoration. If a centerpiece or doily is used a simple design in white is best. We sometimes think that in a busy farm household it is impossible to have flowers on the table all the time, but in reality the country offers the best opportunity to have a pretty table all the year around if we but see the beauty at hand. The children will delight in arranging the flowers if the privilege is given them, and each season of the year will bring new offerings. In winter, bulbs may be bought for a few cents and grown with little trouble. Even this small cost can be avoided by bringing a few carrots or parsnips from the vegetable cellar, splitting them lengthwise and putting them in water in a warm room. In a short time, they will grow into a feathery green centerpiece for the table. In using any sort of a decoration on the table, it should be low enough so that everybody can see over it. Use a vase or bowl that is suitable for the flowers it is to hold, and do not crowd the blossoms.

5. The term "cover" means the space together with the china, silver and glassware allowed for each person. Allow 2 or 2½ feet for a cover. Place each piece of silver so that the end is about one inch from the edge of the table, and let each piece be parallel with the others. Nothing detracts so much from the appearance of the table as having the cloth, dishes, or silver helter-skelter wherever they chance to fall. Place the knife on the right side with the cutting edge toward the plate, the spoons to the right of the knife, and the forks, with tines up, at the left. There should be room between the knife and fork for any plate used during the meal. If more than one knife, fork, or spoon is used they keep the same position with reference to the plate, and are so arranged that the first piece to be used is on the outside of the space allotted. There is one exception to this rule. If raw oysters are served, the oyster fork belongs at the extreme right, since it is the first piece to be used.

The water glass is set at the point of the knife, the bread and butter plate at the tip of the fork. If butter spreaders are used they lie across the edge of the bread and butter plate with the edge toward the edge of the table. If the salad is to be served with the main course of the meal, the salad plate is placed at the left of the dinner plate. The napkin is laid at the left of the plate with the fold on the upper and left sides. The cup and saucer stand at the right of the plate.

General rules for serving. 1. Place and remove all individual dishes, such as the dinner plate, from the right, with the exception of dishes set to the left which must be removed from the left in order to avoid reaching in front of guests.

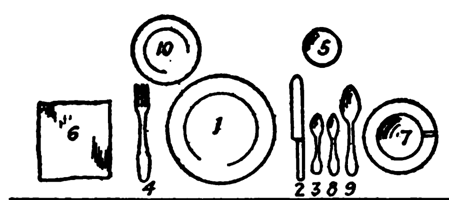


FIG. 161. A properly laid "cover"; 1, plate; 2, knife, cutting edge at left; 3, teaspoon (bowl up); 4, fork (end of tines up); 5, glass; 6, napkin; 7, cup and saucer; 8, spoon; 9, soup spoon; 10 bread and butter plate.

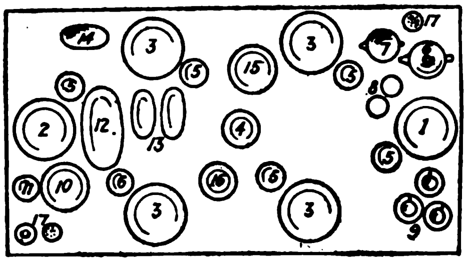


FIG. 162. Farm table conveniently arranged: 1, mother's place; 2, father's; 3, other members'; 4, flowers; 5, bread and butter plates; 6, coffee or tea pot; 7, milk or water pitcher; 8, cream pitcher and sugar bowl; 9, cups and saucers; 10, cereal or sauce; 11, small dishes for (10); 12, meat; 13, vegetables; 14, gravy; 15, bread; 16, butter; 17, salt, pepper, etc.

2. Use the right hand in placing and removing dishes from the right.

3. Dishes from which a person is to help himself should be passed at the left, with the left hand.

4. When passing large dishes, the waitress uses a folded napkin laid on the palm of her hand, although this is unnecessary when handling large, heavy meat platters. For small dishes, a tray with a white doily is used.

5. Glasses should be filled as they stand in place, or if this is inconvenient, draw the glass by the lower part to the edge of the table, using the left hand, and fill.

6. Never make a display of silver or china, or embarrass your guests by using a table service which they do not understand.

7. Remember that all rules for serving have been worked out for simplicity and convenience; adapt them to your conditions.

Serving our own tables. Good service is always possible without help if the menu is so planned that the hostess need not leave the table often. Guests are invited to visit, and when the hostess spends much of her time in the kitchen, or wears a worried look at the table for fear something is going wrong, she is not fulfilling her real duties. However, if the menu is selected with care, and all dishes are omitted which might keep her hot and busy at the last minute before serving, there is no reason why the woman of the house should not appear to her guests calm, composed and cool with a smile and pleasant conversation that are natural, not forced. The following menu, for example, may be easily served without assistance:

Roast meat, pickles, mashed and browned potatoes, buttered asparagus, jelly, rolls, butter, cabbage-pimento-and-nut salad, fruit-gelatin dessert, cake, coffee.

When the guests are seated, the water, butter, jelly, rolls, salad, meat, vegetables and bread will be on the table. At the right of the hostess, on the top shelf of a serving table, are the pitcher of water, the coffee percolator, cups, saucers, sugar and cream. On the lower shelf are the cake and dessert. The guests will assist by passing the coffee and the various dishes, and by passing the soiled dishes to the hostess at the end of the course. She places these on the lower shelf of the serving table as she transfers the dessert and cake to the dining table. All crumbs should be removed from the cloth before the dessert is served.

A menu so planned may be served easily, quickly, and without the necessity of the hostess leaving the table at all during the meal.

Preserving Foods on the Farm

Ten rules for canners. (1) Select only fresh fruits and vegetables. (2) Clean and prepare them. (3) Scald or blanch as directed. (4) "Cold dip" immediately. (5) Pack in the jar. (6) Add salt to vegetables (1 teaspoon per quart jar). (7) Fill jar with hot water or sirup. (8) Adjust rubber and top, leaving the latter loose. (9) Sterilize the required time. (10) Remove from canner and finish sealing; do *not* remove top or rubber after sterilization.

FIG. 163. Canning and preserving may be done in a tightly covered washboiler, but the steam pressure cooker shown in the background, saves time and fuel.

Special points. (1) *"Blanching"* means immersing for the given length of time in boiling water. Count the time only while the water is boiling. (2) *"Cold dip"* means plunging immediately into cold water after blanching. (3) Keep the water boiling hard during sterilization. (4) Follow the time table (p. 205).

FIG. 164. Blanching is easily done in a cheesecloth bag.

Canning poultry. 1. Kill fowl and draw at once; wash carefully and cool; cut into convenient sections. Place in wire basket or cheesecloth, and boil until meat can be removed from bones; remove from boiling liquid and remove meat from bones; pack closely into glass jars; fill jars with pot liquid, after it has been boiled down one half; add level teaspoon of salt per quart jar of meat; put rubber and cap in position, not tight; sterilize as follows, according to type of outfit used: Water bath (homemade or commercial), 3½ hours; water seal (214 degrees F.), 3 hours; 5 pounds steam pressure, 2½ hours; 10–15 pounds steam pressure, 1 hour. Remove jars, tighten covers; invert to cool and test the joint; wrap jars with paper to prevent bleaching.

2. Kill fowl and draw at once; wash carefully, and cool; cut into convenient sections and pack at once into glass jars; fill with boiling water; add level teaspoon of salt per quart; put rubber and cap in position, not tight, and sterilize for 4, 3½, 3 hours or 1 hour, depending on which of the above-listed methods is used. Then remove jars; tighten covers; invert to cool and test the joint; wrap jars with paper to prevent bleaching. (U. S. Department of Agriculture recipes.)

FIG. 165. Pouring sirup into jars of canned fruits.

Drying fruits and vegetables, either in the sun or by artificial heat, is a very practical and economical method of preserving food. The second method is more rapid, more certain, and usually gives better results. Homemade driers are now being used with excellent results; they are cheap and easy to make and use.

Many of the products for which directions are given here may be dried either with or without preliminary blanching. In such cases, both methods are described. Alternative methods are designated by letters. In general, the directions are those recommended by the United States Department of Agriculture.

Sweet corn. Only very young and tender corn should be used for drying, and it should be prepared at once after gathering.

(a) Cook in boiling water 2 to 5 minutes, long enough to "set" the milk. Cut the kernels from the cob with a sharp knife,

CANNING TIME TABLE

Product	Blanch or scald (minutes)	Add Salt (to vegetables) or Sirup (to fruits)	Time of sterilization		
			Water bath	Water seal	Steam pressure (5 lbs.)
Asparagus	3–5	Salt	1½ hrs.	1¼ hrs.	1 hr.
Beans (String or Lima)	5–8	"	2 hrs.	1½ hrs.	1 hr.
Beets	6	"	1½ hrs.	1¼ hrs.	1 hr.
Carrots	6–8	"	1½ hrs.	1¼ hrs.	1 hr.
Corn	8–15	"	3½ hrs.	1½ hrs.	1 hr.
Corn on cob	8–15	"	4 hrs.	2 hrs.	1½ hrs.
Egg plant	8–10	"	2 hrs.	1½ hrs.	1 hr.
Greens	15–20	"	1½ hrs.	1½ hrs.	1 hr.
Okra	5–8	"	2 hrs.	1½ hrs.	1 hr.
Parsnips	6–8	"	1½ hrs.	1¼ hrs.	1 hr.
Peas	5–8	"	2 hrs.	1½ hrs.	1 hr.
Peppers	3	"	30 min.	20 min.	15 min.
Pumpkin	10	"	1 hr.	45 min.	35 min.
Squash	10	"	1 hr.	45 min.	35 min.
Sweet potato	6–8	"	1½ hrs.	1¼ hrs.	1 hr.
Tomatoes	1	"	22 min.	18 min.	15 min.
Apples	—	Thin	20 min.	12 min.	10 min.
Apricots	—	"	16 min.	12 min.	10 min.
Berries (Sweet)	—	"	16 min.	12 min.	10 min.
Berries (Sour)	—	Thick	16 min.	12 min.	10 min.
Cherries	—	Medium	16 min.	12 min.	10 min.
Grapes	—	Thin	16 min.	12 min.	10 min.
Peaches	—	"	16 min.	12 min.	10 min.
Pears	—	"	20 min.	12 min.	10 min.
Plums	—	Medium	16 min.	12 min.	10 min.
Quinces	—	"	20 min.	12 min.	10 min.

FIG. 166. Handy slicer used in drying fruits and vegetables

taking care not to cut off pieces of the cob. Spread thinly on trays, and place in position for drying. Stir occasionally until dry.

(b) Boil or steam on the cob 8 to 10 minutes to set the milk. To improve flavor add a teaspoon of salt to each gallon of water. Drain well and cut corn from cob, using a very sharp and flexible knife. Cut grains fine, only half way down to the cob, and scrape out the remainder of grain, being careful not to scrape off any of the chaff next to the cob. Dry from 3 to 4 hours at 110 to 145 degrees F. When field corn is used, good, plump roasting-ear stage is the proper degree of ripeness. A pound of dried corn per dozen ears is an average yield.

(c) The corn may be dried in the sun after having been started in an oven for 10 to 15 minutes. Sun drying is not satisfactory in moist weather.

String or snap beans. All varieties of string beans can be dried, but only beans in ideal condition for table use should be selected.

(a) Wash, remove stem, tip, and "strings." Cut or break the beans into pieces ½ to 1 inch long, and place on trays and dry. They also can be run through a slicer and then dried quickly.

(b) Prepare as directed above, but instead of cutting the beans, thread them on coarse, strong thread, making long "necklaces" of them, and hang them above the stove or out of doors until dry. An old-fashioned recipe calls for boiling the pods until nearly cooked through before drying.

(c) Wash and string beans carefully. Very young and tender beans can be dried whole; full-grown ones should be cut in quarter-inch to one-inch lengths with a vegetable slicer or sharp knife. It is better to cut beans than to snap them. Put them in a bag of cheesecloth or in a wire basket, and blanch in boiling water for 6 to 10 minutes, depending upon their maturity. Half a teaspoon of soda may be added to each gallon of boiling water to help set the green color in them. Remove surface moisture by placing between two towels or by exposing to sun and air for a short time. Dry young string beans 2 hours, more matured beans 3 hours. Begin drying at a temperature of 110 degrees F., and raise it gradually to 145 degrees. Wax beans are dried in the same manner as the green string beans.

Lima beans. Lima beans can be shelled from the pod and dried. If gathered when young and tender, they should be washed and blanched for from 5 to 10 minutes. Re-

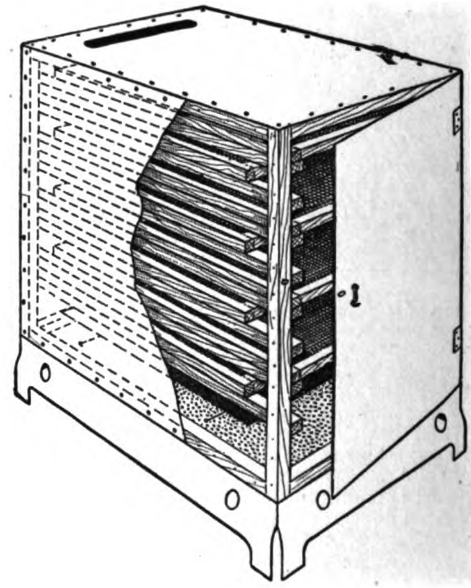


FIG. 168. Homemade dryer cut away to show construction. Note perforated metal bottom and trays alternately pushed back and pulled forward to allow currents of warm air to pass around them. (Farmers' Bulletin 841.)

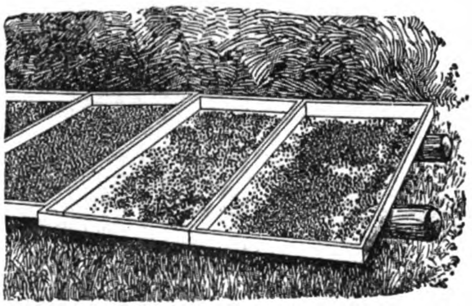
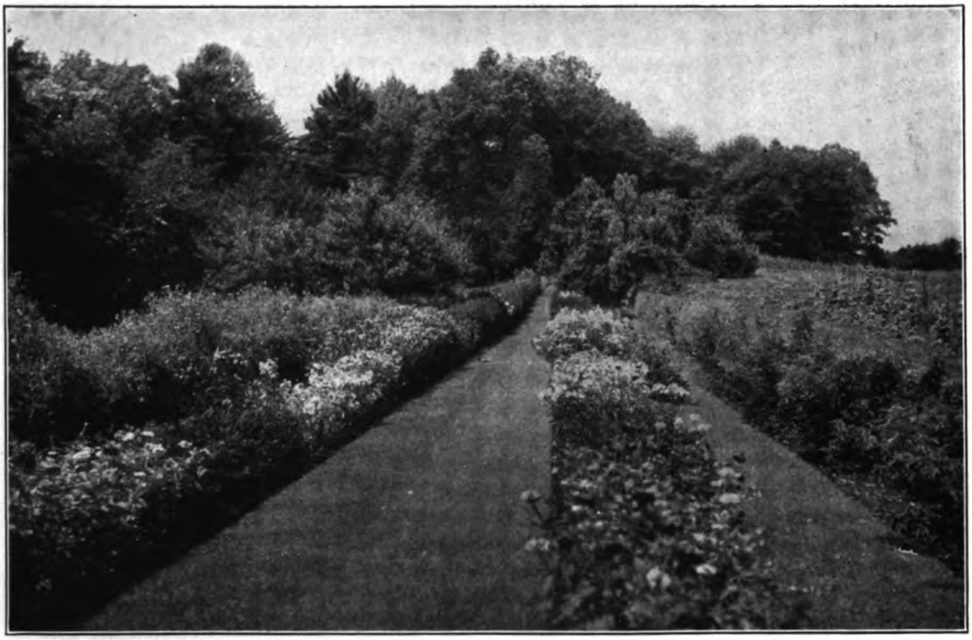


FIG. 167. Fruits and vegetables may be dried in the sun, if protected from insects

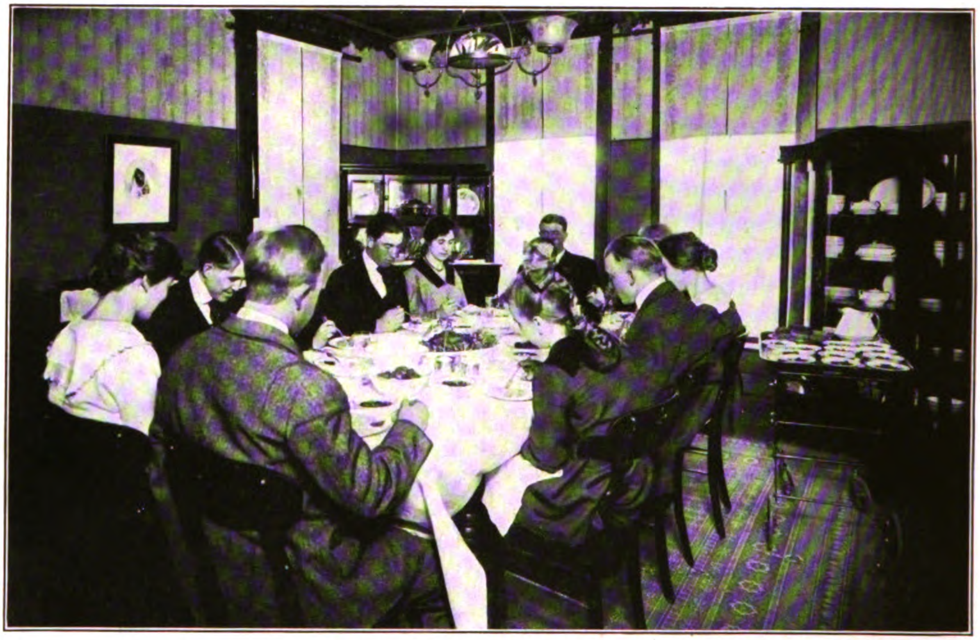
FIG. 169. Fruits and vegetables may be quickly dried in trays by means of an electric fan



By wise use of native trees, shrubs, and flowers, the farmer can add to both the value and the livableness of his farm

The view of a fair countryside and its fertile fields is an asset which, in its fullest measure, none but a farm home can hope to enjoy

When Farm Life Proves Narrow and Unprofitable It Is Often Because the Business Side Has Smothered Out All Other Interests in Life



The problem of feeding the farm family is a difficult and constantly recurring one. System, family coöperation, and modern conveniences help to simplify it

If every farm woman were given as complete an equipment for her work as the average farmer has for his, there would be more happiness and fewer farm failures in the world

THE ONE-WOMAN FARMHOUSE IS EVEN COMMONER THAN THE ONE-MAN FARM. IT SHOULD BE EQUIPPED WITH EVERY LABOR-SAVING DEVICE AVAILABLE

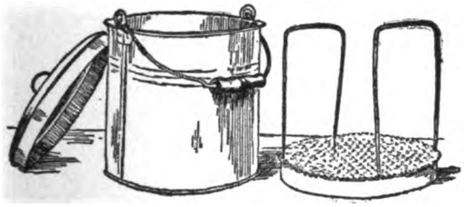


Fig. 170. Simplest possible type of home canner. The false bottom is necessary to prevent breakage of jars

move surface moisture, and dry from 3 to 3½ hours at same temperature as string beans.

Okra. (a) Small, tender pods are sometimes strung on a stout thread and hung over the stove to dry. If dried in that manner, heat in oven before storing on trays.

(b) Wash, blanch 3 minutes in boiling soda water, and dry 2 to 3 hours at 110 to 140 degrees F. Use half a teaspoon of soda to a gallon of water. Dry young and small, tender pods whole. Older pods should be cut in quarter-inch slices.

Peas. (a) Shell and spread on trays and dry.

(b) Shell full-grown peas, blanch them for from 3 to 5 minutes, remove surplus moisture, spread in single layer on trays, and dry from 3 to 3½ hours. Begin drying at 110 degrees F., raising temperature very slowly in about 1½ hours to 145 degrees F. Continue drying 1½ to 2 hours at 145 degrees F.

(c) Shell full-grown peas, pass through a meat grinder, spread on trays, and dry. Whole peas take longer to dry, but when cooked, they resemble fresh peas. The ground peas dry more quickly, but make a product which can be used successfully only in the preparation of soup or purée.

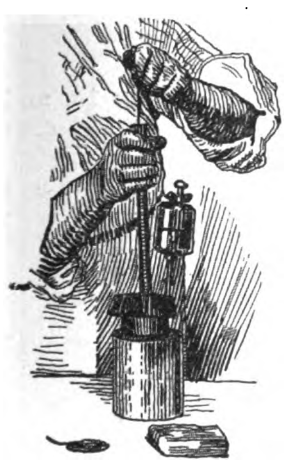


Fig. 171. Using one type of self-heating capping iron

(d) When drying the very young and tender sugar peas, use the pods also. Wash and cut in quarter-inch pieces. Blanch in boiling water 6 minutes. Remove surplus moisture and dry the same length of time and at the same temperature as string beans. It is not necessary to use soda when blanching peas.

Cabbage. (a) Select well-developed heads of cabbage and remove all loose outside leaves. Split the cabbage, remove

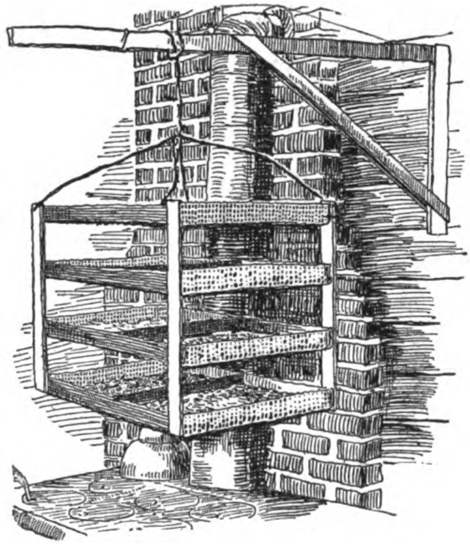


Fig. 172. Homemade wire drying rack suspended out of the way over the kitchen range

the hard, woody core, slice the remainder of the head with a kraut cutter or slicer, and dry.

(b) Shred or cut into strips a few inches long. Blanch 10 minutes, drain, remove surface moisture, and dry 3 hours at 110 to 145 degrees F.

Sweet potatoes. Select sound, mature roots. (a) Wash, boil until nearly done, peel, and run through the meat chopper. Spread on trays and dry until brittle.

(b) Treat as above, but slice instead of running through the meat chopper.

(c) Wash, peel, slice, spread on trays, and dry. A somewhat brighter product will result if the sliced potato is dipped in salt water just before drying.

Apples, pears, and quinces. Early varieties and sweet apples are not well adapted to drying. Winter and fall varieties are much better.

(a) Peel, core, trim, and slice into quarter-inch pieces. Dip in weak salt solution (8 teaspoons of salt to 1 gallon of water). Spread on trays and dry. It is only necessary to dry apples long enough for them to become

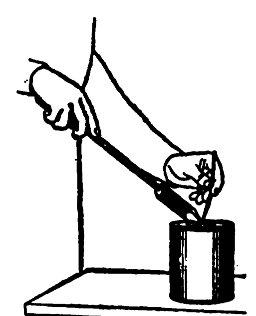


Fig. 173. Closing the vent hole in a can of vegetables with solder and soldering iron.

FIG. 174. In sterilizing leave the jars unsealed, like this—

tough and somewhat leathery.

(b) Pare, core, and cut into eighths, or core and slice in rings, using fruit or vegetable slicer. As apples discolor quickly, do not let them stand long before drying. To prevent discoloration as the fruit is prepared, it may be dipped for 1 minute in a cold salt bath, using 1 ounce of salt to 1 gallon of water. Remove surplus moisture and dry at 110 to 150 degrees F., raising temperature gradually. Dry from 4 to 6 hours, or longer if necessary.

Pears are dried in the same way as apples, or may be steamed 10 minutes before drying.

Peaches. Peaches usually are dried unpeeled, but they are better if peeled before drying.

(a) Remove the stones, cut the fruit into halves, or preferably into smaller pieces, and spread on trays to dry.

(b) Cut in halves, pit, lay in trays pit side up, and dry at same temperature and for same length of time as apples.

FIG. 175.—Until ready to remove them from canner. Then snap tops down.

Food supply suggestions. (1) Bear in mind the various sources you have for your food supply, and make use of each source at the proper season. (2) Compare the cost and quality of home-prepared products with the commercially prepared. (3) Purchase the food supplies needed in large quantities whenever a good storeroom is available. (4) Plan meals at least a week in advance. (5) Prepare the exact amount of food needed; some foods cannot be warmed up or made over. (6) Plan meals to utilize all leftovers—stale bread, fats, meat scraps, bones from roasts, etc. (7) Stint the garbage pail as much as possible.

C. FARM FURNISHINGS AND FARM SEWING

By MARY ELIZABETH ROBINSON, WINIFRED BUCK, *and* MRS. H. J. KEYES. MISS ROBINSON *was born and reared on a farm in Johnson County, Missouri. After graduating from the Warrensburg State Normal School, she taught Home Economics there for 2 years, then spent 2 years at the Michigan Agricultural College where, in 1917, she received the degree of B.S. in Home Economics. Meantime she was Extension Assistant in the Missouri College of Agriculture in which capacity she lectured and demonstrated before farm women throughout the state. At present she is instructor in the same work.* WINIFRED BUCK (*Mrs. Lawrence F. Abbott*) *is the daughter-in-law of the Rev. Lyman Abbott, and the author of "Boys' Self-Governing Clubs," and "The American Girl."*—EDITOR.

Household Furnishings—Their Choice and Care

(*By* MRS. HELEN JOHNSON KEYES)

House furniture and ornaments have been discussed in Chapter 10, and labor-saving household tools earlier in this chapter. There remain to be considered: (1) Beds and bedding, (2) household linens, (3) table ware.

Beds and Bedding

Bedsteads. Metal bedsteads have been popular for many years, chiefly because they are so easily kept clean and odorless; they can be washed with soap and water or even burned clean with coal oil. Brass beds are proof against almost any injury except dents, and those of enameled iron and steel can be renewed with an occasional coat of paint. Steel bedsteads are a little more expensive than iron ones, but they are stronger, and being lighter, are more easily moved and with less injury to floors. They come in designs more like those of brass beds, many of which can not be copied in iron, and their enamel finish is more permanent. When either steel or iron beds are trimmed with brass knobs and rods, these should be heavy and of good

FIG. 176. Undesirable (*a*) and desirable (*b*) types of metal bedstead. Simplicity is always desirable

quality; otherwise they will soon dent and bend.

Let those, however, who can not replace the wooden beds which are theirs already, comfort themselves with knowing that these have a quaintness and charm which metal beds never acquire, and may be kept just as sanitary by the spending of a little more time upon them.

Each sleeper should have his or her own bed. This means improved health and the good temper which comes from refreshing slumber.

Springs. It is worth while to buy a good spring if it can possibly be afforded. We spend more than a third of our lives in bed, and on our comfort during sleep and the healthful postures in which we lie, our health depends. The best springs are the box spiral or woven wire types with a sufficient number of spirals in the middle to prevent sagging. There are cheaper springs than these, however, from which one may expect satisfaction, and for which "boxes" or covers may be made at home of unbleached drilling and fastened to the underside by a lacing running through brass rings or buttonholes. This box increases greatly the durability of the spring, by keeping it from twisting and working crooked. Also it protects the mattress from rust. It can be removed for washing.

Mattresses. Feather mattresses, though much used on farms, are now known to be actually unhealthful both in winter and summer, for young and old. They cause the sleeper to perspire, and yielding freely to the weight of the body, they allow it to get into unwholesome postures.

The best mattresses are therefore of hair; they can be bought in many different grades, at varying prices. Felted cotton is cheaper than hair, very comfortable, and easily done over when it becomes lumpy. Mattresses made of excelsior, corn husks, or even wood shavings, though certainly not soft and luxurious, are to be preferred to feather beds, since they are much more likely to promote the health and energy of young people.

The same general considerations apply to pillows.

Mattresses and pillows should be completely encased in covers of light cotton stuff. Otherwise, the ticking will soon become soiled, and dust will gather on the underside of the mattress. A pad made of old cotton blankets with two or three layers of cotton batting or of newspapers, is a further protection to the top of the mattress.

Coverings. Blankets made of wool filling on a cotton warp are the very best coverings; they are warm without being heavy, and they wash and wear beautifully, even better than the more expensive all-wool blankets.

Homemade quilts and comforters are an economy, for they are made of odd pieces of cloth and in odd scraps of time. If the pieces which are combined are of the same kind of material, with similar designs, the effect is very pretty.

Blankets should be covered by a dimity or calico sheet drawn over them under the counterpane and left on all night when the counterpane is removed. The top of the quilts ought to be kept clean by means of an envelope of calico or similar material, buttoned on or caught with thread, so that it can be removed frequently for washing.

Household Linens

Sheets, pillowcases, towels and table damask continue to be called household linen, although linen has risen to such prices that it has been replaced very generally by cotton and will not be considered at all in this chapter. These are articles on which it is possible to waste or save a considerable sum each year.

Buying. The question whether household supplies shall be bought readymade or the material bleached, cut, and sewed in the home, is one which every housekeeper must

BUYING vs. MAKING AT HOME (1917 FIGURES)

If bought	If made	Saved by making
Sheets, bleached, seamless, plain hem 72 x 86 inches. Each 90 cents. Dozen $10	Unbleached cotton sheeting, 36 inches wide; 10-yard bolt $1.	40 cents per sheet
Pillow cases, ready made, to match sheets, 22 x 32 inches. Pair 50 cents	Same quality as sheets, 22 x 32 inches.	10 cents per pair
Towels, hemmed huck, 35 x 18 inches. Pair 40 cents	Bleached cotton huck, 17½ inches wide; per yard 15 cents	10 cents per pair
Table cloths, cotton damask, 58 x 100 inches; 50 cent quality. Per cloth $1.75	Bleached or colored damask, 58 inches wide; per yard 50 cents	25 cents per cloth
Napkins, 18 x 18 inches, per dozen $1.25	Material to match	25 cents per dozen

decide for herself according to the time at her disposal and her strength. It must not be forgotten that economies cost too much when they wear out the body and spirit of those who employ them, or when they lead to the neglect of the children and of all educational and social interests. In any case, the question can not be intelligently answered without a comparison of the cost of the finished products with the cost of the materials alone. Prices change so constantly that the data on page 211 can only suggest the saving which may be accomplished by home work under conditions that sometimes exist.

Making and Mending Home Furnishings

When making articles using more than one breadth, be careful that the cloth runs the same way in all of them; otherwise the seams will pucker when washed. It is wise to pin the top of the material to an old sheet and, as fast as the breadths are cut off at the bottom, to pull the material to the top again and pin it there. If they cannot then be basted at once, they can be folded away pinned.

Seams are a weak spot and, unless made generously wide, will certainly pull and fray.

Sheets ought to be wide and long enough for thorough tucking in, or for making a bed hospital-fashion in case of illness (p. 236). A firm sheet not only insures the comfort of the sleeper, but is subjected to less wear and tear itself, because it escapes the pulling, slipping, and wrinkling which a loose sheet undergoes.

There is economy in leaving open both ends of a pillowcase, for the thrust of the flatiron against the double end soon wears it out; such a wear is hard to mend except by shortening the case, which cannot always be done. Buttons and buttonholes at one end or both ends give a dressy appearance which does away with the necessity for shams

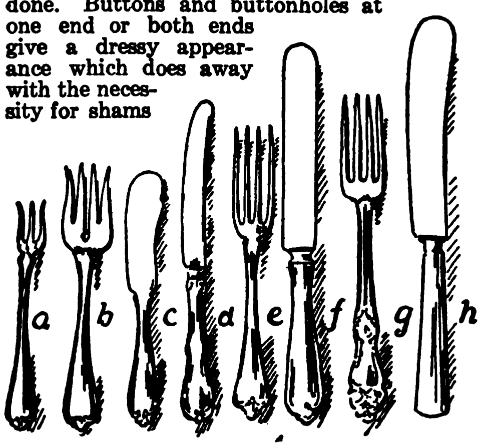


FIG. 177. Flat silver, illustrating some attractive, artistic designs and different types of utensils. (*a*) oyster fork; (*b*) salad fork; (*c*) butter spreader; (*d*) fruit knife; (*e*) tea fork; (*f*) tea knife; (*g*) dinner fork; (*h*) dinner knife.

Hemstitching, beautiful trimming though it is, weakens the material to a degree which is practical ruin. On this account, feather-stitching across sheet hems and cross-stitching along the hems of huck towels are to be preferred. The cross-stitch may be worked in colors and angular designs with fine effect. If lettering is placed on cross-stitched towels, it should be done in cross-stitch in the form of detached or running letters. Otherwise, satin stitch (p. 225) is the handsomest for initials and monograms.

Fringe grows shabby almost at once and is to be avoided on all articles which must be washed. Suitable lace edgings are better.

Nice table damask should always be hemmed by hand; machine stitching will spoil the appearance of the handsomest damask. The so-called French hem is neater than the ordinary one for this purpose. To make it, turn the material up, away from you, the width you want, folding in the edge, of course; then double it back to the same width and crease it. The single and the double edges are then overhanded closely, at the top. When finished, the hem is pressed down to lie like an ordinary hem, with the sewing at the bottom. The narrower it is made, the better.

Mending. The art of making things last a long time consists of mending them the moment a rip, tear, or break occurs. Really, mending should be done before washing, but the task is neither agreeable nor ordinarily practicable in the midst of the family circle.

When sheets tear in the middle, rip them down their lengths and sew the outer selvage edges together, hemming, for the outer edges, the frayed parts which were inside.

Table Ware

China. Dinner and tea sets may be bought at reasonable prices in handsome designs. "Open stock" should be chosen, that is, sets, the pieces of which will be sold separately, so that broken dishes can be replaced. Designs should be flat and "conventional," not rounded out like real flowers. If we are to consider good taste, pressed and near-cut glass are less desirable than simple bowls, jugs, and dishes of pottery or china, because the former are not what they pretend to be.

When china becomes stained with yellow, it may be cleaned, before washing, with a damp cloth rubbed in dry salt, wood, or coal ashes.

Silver. Solid silver is always seen in simple designs, and plated ware which follows this good example is better looking and more dignified than that which is ornate. Each pattern has its name, and it is desirable to keep all the small silver of the same design. Reinforced, triple, and quadruple plate are all reliable and permanent. Nickel silverware, is a composition and is injured by acids and fats if exposed to them for long.

Clothing the Farm Family

(*By* Mary Elizabeth Robinson)

Clothing the farm family correctly and economically is just as important as feeding it rightly. The country woman should first decide whether the family clothing is to be made in the home or purchased ready-to-wear. In either event she should have a knowledge of choosing textiles, designing garments and making them.

The first important step is to gain a knowledge of the textile fibers, which may be classified as: (1) *Vegetable*—Cotton, linen, jute, hemp, ramie. (2) *Animal*—Wool, silk, hair. (3) *Mineral*—Asbestos. (4) *Artificial*—Luster, cellulose, gelatin silk, metallic threads, spun glass. Without a thorough knowledge of these fibers the woman is helpless when it comes to making the proper selection of clothing. She should be able especially to distinguish between the four common fibers—cotton, linen, wool and silk. Linen, silk and wool are often adulterated with cotton, the cheapest fiber; the resulting materials may wear better than the pure fiber, but the disadvantage is that the purchaser is paying linen or silk or wool prices for cotton.

The characteristics of the four fibers most commonly used in clothing and household textiles are:

Cotton. (1) Inexpensive; (2) strong and elastic; (3) good conductor of heat; (4) dyes easily; (5) launders easily; (6) not easily affected by heat or alkali; (7) easily affected by acid; (8) absorbs moisture and gives it up slowly.

Linen. (1) Strong and durable; (2) launders easily and leaves no lint; (3) snowy white when bleached; (4) smooth and glossy when laundered; (5) good conductor of heat; (6) wrinkles easily; (7) not easily affected by acids; (8) water readily absorbed and evaporated; (9) does not retain stains as persistently as cotton.

Wool. (1) Difficult to launder; (2) not a good conductor of heat; (3) readily affected by heat and sudden changes in temperature; (4) elastic; (5) readily affected by friction; (6) absorbs a large amount of moisture, especially in damp weather; (7) very kinky, with scaly structure.

Silk. (1) Absorbs moisture readily; (2) poor conductor of heat; (3) readily affected by friction; (4) scorches easily; (5) careless washing destroys gloss; (6) strong and tenacious; (7) wears well (when pure); (8) soft and light in weight; (9) easily injured by high degree of heat or sudden change of temperature; (10) easily dyed; (11) absorbs moisture readily.

Textile tests for purity. The laws of our country offer no protection to the purchaser of materials. Therefore to protect themselves, women should know a few practical tests to determine the content and value of materials. The object in making these tests is to discover if cloth is adulterated, artificially dressed or misrepresented in any way.

1. If water is dropped on linen goods the moisture spreads rapidly, but if dropped on cotton it will remain unabsorbed for some time. This is not always a safe test as cotton and linen are often heavily "sized" with dressing which prevents the water from being absorbed.

2. A much safer test may be made by drop-

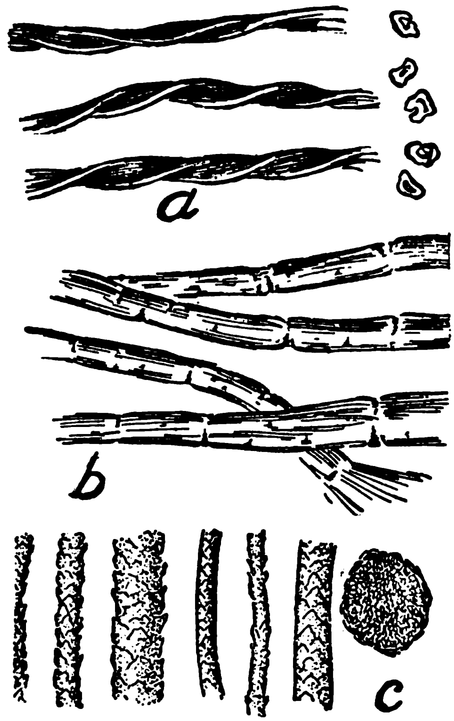


Fig. 178. Textile fibers greatly enlarged: (*a*) silk; (*b*) cotton; (*c*) wool

ping glycerin on the cloth. Linen will become transparent but cotton will not be affected.

3. When crushed in the hands, linen wrinkles more than cotton.

4. Cotton and wool mixtures, when moistened, wrinkle more than pure wool materials.

5. Material may be tested by pulling out threads and examining the ends. Cotton fibers are short, with fuzzy ends; linen fibers are long with uneven ends, usually pointed; wool fibers are short, kinky and stiff; fibers of reeled silk are long, straight and lustrous, while fibers of spun silk are short and easily broken.

6. Sizing may be discovered by rubbing the material between the hands to see if the "dressing" will come out. Washing will also remove dressing.

7. Each fiber has a characteristic burning test as follows: (a) Cotton burns quickly with flame. (b) Linen burns like cotton, but is not as inflammable as it has less oil in the fiber and less air in the woven cloth. (c) Wool burns slowly, gives off an odor like burnt feathers, and leaves a gummy residue. (d) Silk burns more slowly and with less odor than wool, and leaves a crisp ash. Silk leaves even more ash when weighted.

Textile tests for strength. *Yarns and threads.* Single yarns are not so strong as those where 2 or 3 threads are twisted together. Ravel goods and find out how many threads are combined. Yarns and threads are stronger, also, when combed so that their fibers lie side by side, instead of crossing irregularly. An examination of ravelings will show how the strands lie.

The weave. Under a magnifying glass count the number of threads to an inch which run in each direction—warp and woof. The higher the number the stronger the cloth. Then hold the cloth up to the light to see if the threads are close together and of the same thickness. Rub the thumb across the weave. If the weave is loose the thumb will leave a pathway of separated threads, and the material will not wear well.

Is the cloth elastic? If a material is elastic it will not wrinkle and it will drape well. To find out, crumple the goods in the hand; if, when released, the goods spring up, it has the desired quality.

Is the material "weighted"? In order to give body and weight, and to conceal loose and flimsy weaves, materials are very often weighted. In the case of cotton goods starch is most frequently used. To find out, tear the goods quickly; if dust flies, weighting is present.

Is it strong enough to keep its shape? Grasp the cloth with both hands about an inch apart and pull steadily. Do this in both directions. Cloth is only as strong as its weakest point.

Tests for woolen and worsted goods. *Are the short fibers, called flocks, well worked into the goods?* Brush the back of the material with a stiff broom. If short fibers are loosened, the flocks are not well worked in and the cloth will soon become shabby.

Will the cloth wear shiny? Wet the thumb and rub it *against* the nap. If the nap seems to stand up and resist, it will not wear down easily. Thick, short fibers are durable; long, loose ones are not.

Tests for permanence of color. *Are the colors "fast" against light?* Boil a sample in soapsuds for 20 minutes, putting a piece of white cloth in at the same time. If the white cloth is stained, the color is not fast against washing.

Are they "fast" against rubbing? Rub a dry sample briskly against white goods.

Are they "fast" against rain and dust? Sprinkle a sample with water in which is a little lime. Dry and then brush it. If the brushing shows up spots, the color will not prove fast against rain and dust.

The Hygiene of Women's Dress

It is evident, judging from the modern dress of women, that the hygiene of dress has not been given serious consideration. Clothes are worn—or should be worn—first, to maintain a constant body temperature; second, to protect the body from heat and cold. Comfort and adornment should also be considered in the selection and choice of clothes, as should occupation, climatic conditions, state of health and age of the individual. Most of our modern styles fail to meet these requirements, although a good many women are adopting sensible, practical styles. No individual can afford to disregard fashion entirely, but any one can select healthful, comfortable, artistic and appropriate clothes.

A most important function of clothes is to aid the body in maintaining a constant temperature. The healthy body must always maintain a temperature of about 98.6 degrees, regardless of surrounding conditions. When the throat, arms and ankles are exposed in cold weather, the body wastes energy, and no individual can afford this waste, especially if the diet is deficient, as is often the case with young girls. Resistance to infection

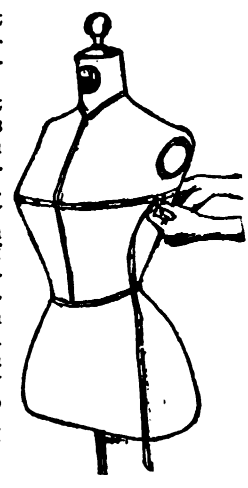


Fig. 179. Correct method of taking bust measure on a dress form.

by various disease germs is lowered by exposure to severe cold. Thus, in cold weather, the amount and character of the clothing should be changed in order to diminish the heat loss of the body which is regulated chiefly by controlling the evaporation and radiation from its surface. This can be accomplished in part by the use of proper clothing, since clothing of any kind holds a layer of warm and moist air between it and the skin, thus diminishing both evaporation and radiation.

Underwear. A close relationship exists between the regulation of bodily temperature and the kind of underwear worn. *Woolen* underwear would be ideal for winter were it not for 5 facts: (1) It is very difficult to keep clean. Wool fibers, owing to their structure, absorb the sweat and oily secretions of the skin and hold them, and bacteria thrive in woolen underwear. (2) Wool does not absorb or give up moisture rapidly. (3) Strong soaps and boiling water cannot be used in washing wool. If woolen underwear is laundered carelessly, the fibers mat, the air spaces are closed, and the garment loses its feeling of warmth. (4) Some persons cannot tolerate wool next to the skin on account of its irritating properties. (5) Woolen underwear is expensive.

Wool mixed with cotton or silk makes good underwear, especially for aged people, children and invalids.

Cotton underwear is more generally used than any other kind. When woven with an open mesh, cotton acquires a feeling of warmth, the large air spaces making it resemble wool. More dirt clings to cotton than to linen, but cotton launders easily and hence is a very sanitary material. Cotton underwear has from 15 to 30 per cent more heat than linen. In a close, tight weave, cotton is a good conductor of heat, which is the reason a garment of this kind feels so cool in summer. It is cheap, very durable and easily laundered.

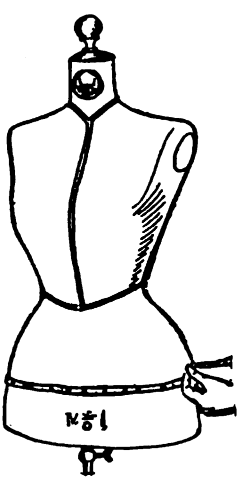


FIG. 180. Unless the dress form is of the right dimensions it is liable to give more trouble than help.

Linen underwear is more expensive than cotton. It is used in very warm countries. The chief objections to it are that it (1) may cool the body too quickly, (2) musses easily, and (3) does not last as long as cotton as it frays on the edges.

Silk underwear loses its moisture more rapidly than wool and therefore is more sanitary. For those who cannot wear wool next to the skin and to whom cost is no consideration, silk is an excellent material for undergarments. It is more easily cleaned than wool; and being light, though warm, it takes up little space.

The subjects of personal hygiene (bathing, etc.), and hygienic underwear should be considered together in order to get the best results and maintain good health.

Outer garments. Simplicity in style of dress adds to the attractiveness of both girls and women. In determining the style most becoming to the figure, pay careful attention to the length of the waist, the bust measure, the hip measure and the length of the skirt; for example, a tall figure with a short waistline may be improved by a dress with a longer waistline. In this way a figure out of proportion may be concealed, or its defects may be corrected. When the most becoming type of dress has been selected, both house and street dresses should be modeled along this general plan. Economy of time and labor in both planning and making may be practised in this way. Then, too, only one style of underclothing is required. A great deal of time may be saved in designing a garment by buying patterns of firms that make the proportion of figures as well as fashion a study.

Accessories. These may be listed as follows: Collars, cuffs, ties, belts, girdles, scarfs, nets, parasol, fan, hairpins, and combs. Without them the wardrobe would be incomplete, although the modern woman in many cases spends too large a per cent of the cost of her clothing here. In selecting an article for this part of the wardrobe consider especially: (1) the need for its purchase; (2) the use to which it will be put; (3) its durability; (4) its suitability to the wearer; (5) its cost in relation to the income.

A Few Hints for Home Sewing

(*By* WINIFRED BUCK)

One who sews well can often make over and remodel her clothes for years, provided they are made of good material. Spring is the best time to get a suit, and a ready- or tailor-made one is always more satisfactory than a homemade one. A wise choice is of black or navy-blue serge, as these colors and this material not only wear splendidly, but always can be matched. Two months' wear will probably be gotten out of such a suit the first spring. The following fall, by ripping out the lining of the coat, putting in an interlining of cotton batting, and replacing the outer lining, the suit is made warm enough for winter.

The next spring the interlining is taken out. If the outer lining is worn under the arms, it can be patched—and matched—by cutting off the sleeve lining about halfway between

the elbow and the shoulder and using that to mend the body of the lining. The absent part of the sleeve lining can be replaced by any kind of material, as it will not show.

At this time the suit will probably need no other alteration, but if one is tired of it, an easy and pretty way to change it is to put on a collar and cuffs of some contrasting color in cloth, silk or velvet.

The second fall the suit will probably need a new lining; perhaps an old silk dress or an old skirt of alpaca or sateen can be used. However, a new cotton lining will not cost much and should be preferred to material of doubtful strength. The cotton-batting interlining, having of course, been saved, can be replaced. The suit will also need cleaning and pressing and, perhaps, new buttons. The skirt, if it is a long one, will be worn at the bottom and should be turned up. The worn part may be covered with common dress braid.

By the beginning of the third year, the suit will certainly need alterations on account of the changing styles. If the change needed is to make the skirt narrower, remove a breadth or straighten the breadths if they flare at the bottom. If the skirt is circular and the new fashion calls for a gored one, it must be ripped and the paper pieces of the new pattern pinned upon the material and the whole thing cut out as if new.

If a narrow skirt needs considerable widening, it will be absolutely necessary to insert extra material, and here the choice of an easily matched material proves its value. The coat usually needs no alteration except lengthening or shortening. It can be lengthened prettily by adding a band of dull black satin 4 inches or more wide and by repeating this on the bottom of the skirt and on the collars and cuffs.

A good suit, even after 3 years' wear, will still have much durable material in it which should provide at least one little girl's dress. The skirt will cut advantageously as a one-piece, pleated dress with either kimono or set-in sleeves; and a dress with sleeves, yoke, waist, and skirt for a tiny girl, or a wee pair of trousers may be gotten from the coat and scraps from the skirt. Before cutting up an old suit for the children, wash and press it, and make the new garments with the inside out.

It is a good plan to make two working dresses of exactly the same material. After a year of hard wear and constant washing, the waists of these dresses will be worn out, but by making a waist out of the skirt of one and attaching it to the skirt of the other, a work dress can be obtained which will last several months more.

In buying a silk dress, figure on using it by and by for a coat lining or a shirt waist. Or let this dress sometimes be of black satin, chiffon cloth, or georgette crêpe, for these materials not only wear well themselves, but are invaluable to combine with other goods when making over a garment. It is a good plan to get a little more silk than is needed at the moment, for use in future alterations.

When a garment is to be thoroughly remodeled, it is best to rip, brush, and clean it, pick out the old stitches and press it. Then fasten the pattern upon it and cut out the new dress. This is a little more troublesome than making a dress of new material, but when it is done it will look almost like new. Unless the material is fresh and strong, however, it will not be worth all this trouble. More frequently some trifling alteration will be all that the costume needs or is worth. If sleeves are too short, they can be lengthened by a cuff matching or contrasting with the suit. Skirts can be lengthened either by letting down the hem and facing it, or by making a yoke at the top. If the skirt is lengthened by letting down the hem, and there are worn places where the bottom of the skirt used to be, a small, carefully measured tuck can be taken just above the worn places and made to lie over them. Sometimes a skirt gets worn thin on the hips where the elbows rub. In such a case a yoke can be made at the top of the skirt, from extra material if available, from the pieces cut from the skirt gores, or from black satin, starting at each side of the top breadth in doing this. If black satin is used, this material should be repeated on some other part of the dress.

To mend a hole, pull out threads from the seams or hem and darn the hole with them. A hole darned with thread which does not match the material looks badly.

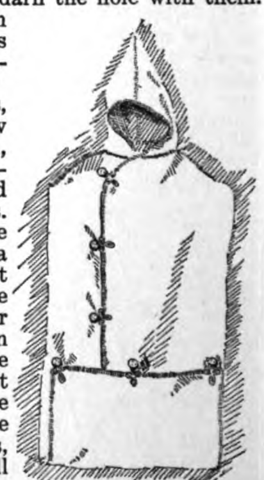


FIG. 181. Baby bunting wrap (see p. 218)

In making dresses, one must know how to sew well by hand, even though a machine is to be used for all long seams. Do not try to make a garment without a pattern. Spread out the material on the dining-room table or on a clean sheet on the floor. Have plenty of pins at hand. Arrange the different parts of the pattern on the goods, so that none of it will be wasted. When the pattern pieces are all arranged satisfactorily, pin them firmly to the goods. Then cut around them with a large, sharp pair of scissors. Allow for generous seams and hems which make alterations easier by and by, and give the garment strength.

The edges of the newly cut-out pieces should be laid together accurately and firmly basted with stitches not longer than half an inch. A friend will then be needed to help in fitting unless a form (p. 218) is used. Provide her with pins so that she can fasten firmly the seams she lets out or takes in. After removing the garment, put basting stitches in place of the pins; then sew it on the machine and try it on again.

A popular fashion is for waist and skirt to be fastened to an inside belt. This belt should be fitted and have hooks sewed on it before the waist and skirt are attached. After the waist and skirt are firmly sewed to the belt, the armholes should receive attention. They are important, for if they do not fit well the comfort and appearance of the dress is spoiled. The sleeves are next placed, tried on, and finally sewed.

The turning up of the skirt hem, the placing of the outside belt, and the finishing of the neck and cuffs are the final acts in making a gown.

A good general principle is that it never pays to spend much money for altering a very old gown.

Always save bits of unworn lace, fresh silk, hooks, snaps, buttons, collar wires, etc., but particularly pieces of material used in the dresses. They will all be useful for freshening up some old garment, and their use will save more money than is usually realized.

Infants' Clothing

The importance of infants' clothing cannot be overestimated. The new-born babe is not able to select its own clothing, nor is it able to say when it is uncomfortable. Therefore, the mother should know how to vary the clothing with the season of the year in order to maintain the body temperature. Accordingly, unless there is a knowledge of fabrics, many babies will be kept too warm or too cool.

Wool is the best fabric for conserving heat, because of the air spaces between the fibers. Cotton flannel is warmer than plain cotton material for this same reason, but with repeated washings it tends to lose its woolly character. An all-wool fabric is undesirable because of the shrinkage when laundered. When combined with silk or cotton, the shrinkage is prevented, and, too, the material forms practically as good a non-conductor of heat as pure wool.

Recently women have begun to realize that the plain substantial garments are better for children of all ages than the much-trimmed garments, formerly used. Especially is this true of clothing for babies. In the first place, a well-fitting, simple design gives the freedom of movement necessary for free breathing and circulation. Garments too large, as well as those too small, are uncomfortable; trimmings, such as tucks, ruffles, embroideries and laces, cause unnecessary work for the mother, and fret the baby; extremely long dresses are being practically abandoned, since they serve no purpose whatsoever. Rompers are especially recommended when the child begins to crawl or walk.

Clothing for all ages should be made so that it is an easy matter to dress the child. The dressing of a baby can be simplified by using "Gertrude petticoats," which fasten on the shoulder, and slips opening entirely down the back. If the proper thought and care is taken in the older children's clothing, many children would be enabled to dress themselves at a comparatively early age, thus assisting the mother very materially.

In preparing an infant's wardrobe, the number of garments and the choice of fabrics will be governed by the amount of money which the mother wishes to spend. If materials are bought in quantity and the sewing is done at home, the cost need not be prohibitive. The following list is the smallest possible number of garments the baby will need:

3 Skirts of wool and silk, or wool and cotton. The ready-made ones fit and wear best. Size No. 2, with long sleeves, should always be selected.

3 Bands (Abdominal) of wool, or wool and cotton mixture. Size 6 or 8 by 20 inches. No hemming and no ravelings. Ready-made knit bands may be substituted for these if there is actual need, after the navel cord has come off.

4 Petticoats of wool and silk, wool and cotton, or cotton flannel. Make garment to open on the shoulder in order that arms will not have to be put through the armholes. Finish seams on right side. Length, 27 inches.

3 Night gowns (if worn by very young infant instead of dresses, at least 6 will be needed) of cotton flannel, made to open all way up back, and with sleeves long enough to cover child's hands. Length, 27 inches, unless tape is used to draw up bottom, when it should be 30 inches.

8 Slips of nainsook, crêpe or soft linen, made to open all way up back, and with no trimming around neck. Length, 27 inches.

48 Diapers of cheap cotton flannel, with soft pad which may be burned. Size, at first 24 inches, later 27 inches square; pad 8 by 6 inches.

FIG. 182. A well-lighted, well-equipped sewing room where work can be left undisturbed, is a valuable feature of the farmhouse.

2 Cloaks and caps, one for winter of eiderdown or soft wool lined; one for summer, cashmere lined with silk. Baby bunting wrap (Fig. 181) is style preferred.
3 pairs stockings, wool and cotton for winter; cotton for summer. Size 2.
1 pair shoes to be used when baby begins to play on floor. Must be broad enough for free exercise and use of toes.

Sewing Equipment

A well-made garment requires well selected and substantial sewing equipment which, to render the most efficient service, should be kept in one certain place in the house. Every woman knows what a comfort it is to find her sewing just as she left it when she was called away to some household duty. A room, light and conveniently located, should be provided for when building a new house. However, since most homes have no room of this type, a portion of a hall or bedroom usually must and should be set aside for the sewing work.

Essential Sewing Equipment

Sewing machine with attachments
Cutting table
Skirt gauge
Ironing board and iron
One yard of pressing canvas
Small bowl for holding water
Yard stick

Sewing box or basket, containing shears, small scissors, emery, tracing wheel, stiletto, thimble, tape line, needles, pin cushion, pins.

For a somewhat more elaborate equipment, add: Dress form, wardrobe, wrapping paper, leveling table, and ripping knife (safety razor blade preferred).

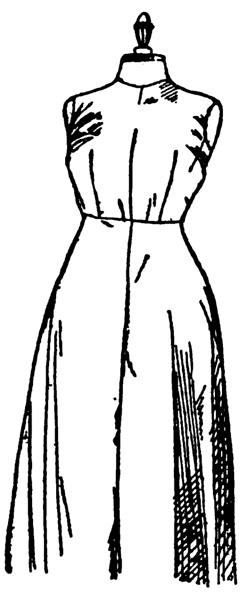


FIG. 183. A homemade dress form, padded to meet the requirements of the individual.

The homemade dress form. Without a dress form a woman is almost helpless when it comes to doing her own fitting; often a garment is put away unfinished after the woman's patience is exhausted. But most of the reliable dress forms on the market are beyond the purse of the average housewife; and, if one can be bought, it is difficult to find a form which can be used without some alteration. Like commercial patterns, dress forms are made according to average measurements, and few women happen to be average in every particular.

The most efficient and, on the whole, a most easily made form is the padded type

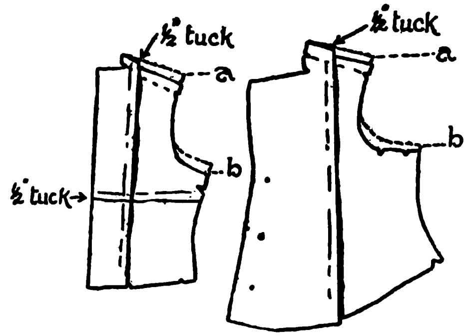


FIG. 184. How the waist pattern may be altered without affecting its lines

based on a purchased foundation dress form. In selecting this, take care to get one small enough. The hip and bust measures must both be taken into consideration as well as the thickness of the form in comparison with that of the individual. A very good rule is to purchase a form 2 sizes smaller than the bust measure. Misses' forms are best as the bust and waistline are not so marked as in ladies' sizes. Misses' sizes are given by age corresponding to the following bust measures:

18 years—38 bust; 14 years—34 bust
16 years—36 bust; 12 years—32 bust

A foundation form for a child of 12 years is a good size to use if a finished form with a bust measure of 34 inches is desired.

The covering of this form requires 6 yards of some dark-colored cambric which does not soil easily. A lining, closing in the back, is cut from this material, basted and fitted snugly to the person for whom the form is being made. On the carefulness of this fitting depends the success of the fitted form; it must be very snug in order to keep the finished form small enough. Correct curves should be made by darts made in the lining. Sew the waist and skirt together and fit a collar onto the waist. Then take the length and hem the skirt before putting it on the figure.

When all stitching has been done, put the lining on the form and notice where it needs filling out. Two or three rolls of cotton batting will be needed for this purpose and care will be required to get the cotton filled in smoothly. Before sewing up the lining in the back, pin it together and measure it carefully to see that the padding has been done correctly. The form may be tested, too, by trying on a well-fitting waist and skirt.

The cost of this form finished is approximately $3.50 with materials at an average price.

Alteration of Patterns

Commercial patterns are made to fit average figures and should, therefore, be carefully tested before being used. This may be

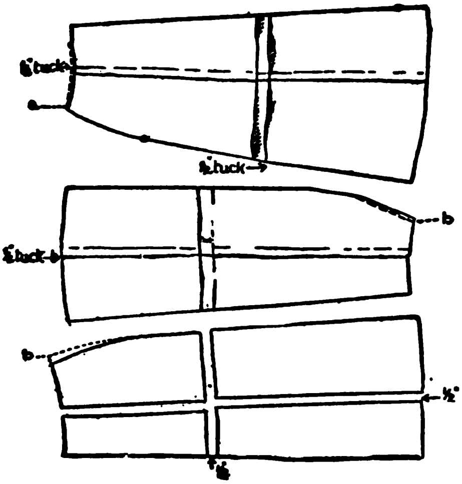


FIG. 185. Altering a skirt pattern

done in 2 ways: (1) Take the measurements of the figure correctly and alter the pattern accordingly. (2) If the garment is to be made of expensive material, first model a garment from cheap material and test its fit as well as its style. In altering patterns, the following measurements should be taken.

Waist. A—Neck measure around neck at the base.

B—Length of back from bone at base of neck to waistline.

C—Length of front from hollow of neck to waistline.

D—Width of back, across broadest part of back between armholes.

E—Width of front, across chest 3 inches below hollow of neck.

F—Bust measure around fullest part of bust and straight across the back.

G—Underarm measure from hollow of arm to waistline.

H—Armhole, around the arm over the shoulder bone.

I—Waist measure, snug measure around smallest part of waist.

J—Length of arm, inside of armhole or hollow to wrist and outside from shoulder over bent elbow to wrist.

Skirt. Waist (same measurement as I above).

K—Hip measure, taken loosely around the hips 6 inches below the waistline in the front and parallel with the floor.

L—Length; front, side and back are taken from waistline to floor. Any change in length is made from this measurement.

Every woman should own a perfectly fitting foundation waist and skirt pattern. This will serve for a large number of garments since it may be altered and may be used either for a 1-piece or a 2-piece dress.

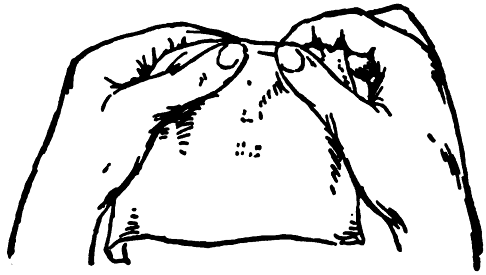


FIG. 186. How to hold goods in making a running stitch

Money may be saved by thus altering patterns already on hand to fit various members of the family. Any alteration in the size of patterns should be made without disturbing the arm's eye, the neck or the curves over the hipline.

The Construction of Garments

Cutting. When the material for the garment has been carefully chosen and the pattern tested according to the measurements of the figure, the next step is the cutting. Be careful to observe closely the following points in cutting material for a garment: (1) Right and wrong side; (2) matching design in figured material; (3) nap; (4) placing pattern on material in economical way; (5) pinning the pattern on securely; (6) cutting with long strokes and using large, sharp shears.

Stitches. A—Temporary stitches:

1. *Basting* is the stitch used to hold two pieces of material together until firmly stitched.

(a) Even basting is used when there is a possibility of slipping or a strain on the seam. The stitches are usually made a quarter of an inch long on

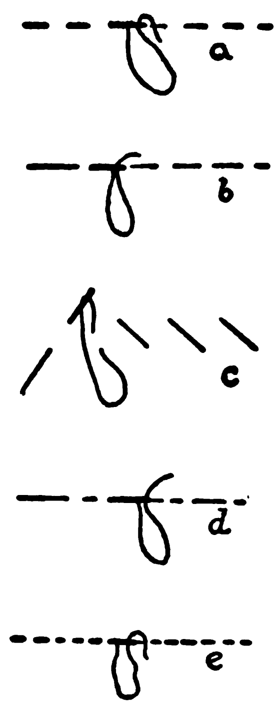


FIG. 187. Types of basting: *a*, even basting; *b*, guide basting; *c*, diagonal basting; *d*, dressmakers' basting; *e*, running stitch.

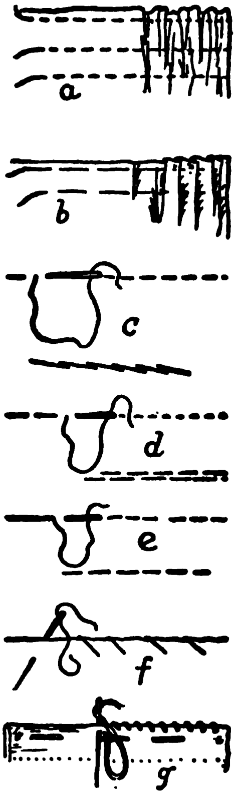


FIG. 188. Types of permanent running stitches: *a* shirring; *b* gauging; *c* backstitch, right and wrong sides; *d* stitching stitch, right and wrong sides; *e* combination stitch, right and wrong sides; *f* overcasting; *g* overhanding.

both the upper and under sides of the material.

(b) Uneven (guide) basting is used where there is little or no strain, or to mark lines for joining materials. The space between the stitches is longer than the stitch itself (three eighths inch and one eighth inch respectively).

(c) Diagonal basting is used where more than one row of basting is needed, as it may be substituted for two rows of basting. The stitch varies in length from a half inch to 2 inches, according to the purpose for which it is used.

2. *Tailor's tack or mark stitch* has as its purpose: (1) the marking of seams in tailored garments so that both sides of the garment being made will be exactly alike; or (2) to mark plaits, etc., in commercial patterns in order that the various parts may be more easily matched.

Mark stitches are made by using a double thread of basting and a double thickness of cloth. Take 2 even basting stitches, then skip one half to three quarters of an inch and take 2 more stitches, leaving a loop of thread 1 inch to 1½ inches long between each two. Then separate the 2 pieces of material and cut the threads between them. In this way both pieces of the garment are marked exactly alike.

B—Permanent stitches:

1. *Running stitch* is used for gathering or tucking, and for seams that do not require strength. These stitches are made like even basting, but much shorter. Several stitches should be taken up before pulling the needle through the material.

2. *Back stitching* is used for seams where there is much strength required. To make this stitch, first take a very short stitch, then put the needle back to where it was first put into the material and bring it out the same distance beyond. Take the second stitch by putting the needle back to the end of the last stitch and bringing it out the same distance beyond. Always advance from the under side of the material, making the under stitch twice the length of the top stitch. When carefully done, back stitching closely resembles machine stitching.

3. The *combination stitch* is a combination of the running and back stitches, made by using 3 running stitches, then a back stitch, then 3 running stitches, then a back stitch and so on, until the seam is completed. This stitch is used where more strength is needed than may be given by the running stitch.

4. *Overhanding* is used in holding together two edges, usually selvages. This stitch insures a flat seam. After basting the edges together, hold the material in the left hand with the edges between the thumb and forefinger. Take the stitches very close together just deep enough to catch the material with the thread, going over the edges of the material with the needle pointed directly toward the worker. When completed the seam may be opened and pressed perfectly flat, the selvages just touching.

5. *Overcasting* is made over and over the edge of material to keep the raw edge of a seam from raveling. This stitch may be made quite rapidly when several stitches are taken at one time.

6. The *blanket stitch* is used to finish the edges of flannels and other woolens. The edge of the material is held next to the seamstress and the stitch is made by bringing the point of the needle out over the thread, then drawing the thread up to form the stitch.

Seams.

A — The *French seam* is used in making undergarments and outer garments modeled from lightweight materials. To make this seam, allow three eighths of an inch in materials which do not ravel and three quarters of an inch in materials which ravel.

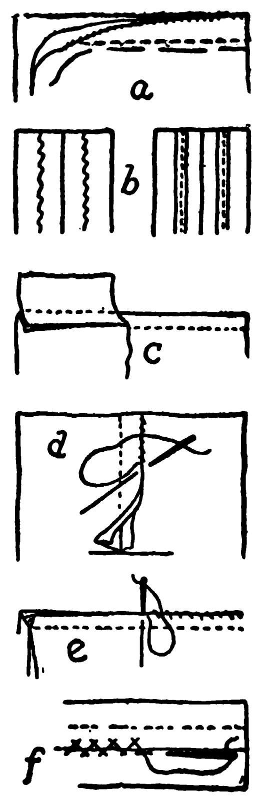


FIG. 189. Types of seams: *a* plain seam; *b* pinked seam (*left*) and bound seam (*right*); *c* French seam; *d* hemmed fell; *e* overhanded, or French fell; *f* flannel fell.

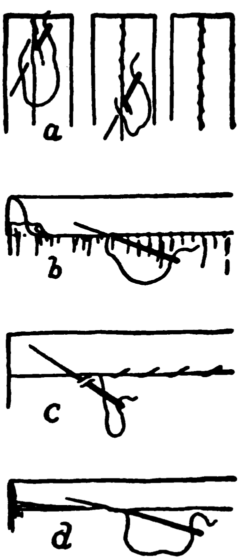


Fig. 190. Types of plain hemstitching: *a* plain hemming; *b* vertical hemming; *c* blind hemming; *d* slip stitching.

Pin and baste together the materials and make the first stitching on the right side of the material one eighth to one quarter inch from the edge. Then reverse the fold so that the seam edges come within the fold, crease, and stitch one fourth inch from the edge. This row of stitching must entirely cover all raw edges from the first stitching. This seam may be used in hand-made garments, the running stitch being used for the first stitching, and the combination or back stitch for the second.

B—The *hemmed fell* is used in making undergarments. To make it, place the two right sides of the cloth together. Baste and stitch so that the upper side of the stitch comes to the right side of the seam. Trim the under side of the seam to one quarter or one eighth inch. Fold the wide edge over the narrow and baste both flat to the cloth. Then hem the edge of the fold to the cloth.

C—The *stitched fell* is made like the hemmed fell except that all stitching is done by machine and the seam is finished on the right side of the garment instead of the wrong.

Hemming. A hem serves the purpose of a finish for a garment or that of an ornament.

A—*Plain hemming* is made by twice folding the edge to be hemmed, the first fold very narrow (one eighth inch), the second the width of the desired hem. The second fold is first basted securely into place and then fastened down with a slanting stitch taken through both thicknesses of material. This stitch is commonly called a whipping or hemming stitch. The edge of the material is held away from the worker, the material itself in the left hand, and the needle in the right, always working from right to left. When working with silks or materials where close stitching is not desired, the stitch may be made as described above, but the distance between the stitches increased. This is called the slip stitch.

B—The *napery or French hem*, is used on table linens, etc. To make it, crease the material as for the plain hem, then turn the second fold back on the material. The stitch is the same as given for the overhand stitch.

C—The *rolled hem* is used on sheer materials when setting in insertion or applying lace. This hem is made by trimming the edge of the material evenly, then with the wrong side toward the worker, rolling the edge tightly with the thumb and index finger of the left hand. The needle is started toward the left, the stitch going under and over the roll, thus keeping the raw edge from showing.

D—The *flannel hem* is used in the making of infants' garments, etc. The raw edge is not turned in, but is held in place with a catch stitch on the wrong side. The right side may be finished with some simple decorative stitch.

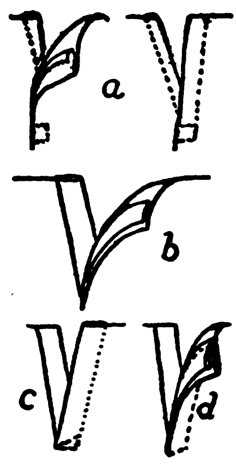


Fig. 191. Types of placket: *a* two methods of making hemmed placket; *b* bound placket; *c* bound and faced placket; *d* continuous bound and faced placket with fly.

E—The *shaped hem* is used in the finishing of undergarments. To make it, turn the material up on the right side after the desired length has been taken. Then mark off the scallops the desired shape and size, stitch and cut around the scallops $\frac{1}{4}$ inch below the seam. Turn the hem so that the scallops will be right side out. Baste securely and stitch on both the edge of the scallops and at the top of the hem. If desired a simple decorative stitch may be used at the top of the hem.

Plackets. The *hemmed placket* is used in garments where there is little strain and is the simplest in construction. The slit is cut, and hems folded on either side, the one which is to make the lap being made wider than the one underneath. A plait is thus formed below the vent. A double row of stitching should be made across the bottom of these hems to strengthen the placket.

The *bound and faced placket* is used for both undergar-

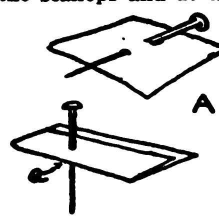


Fig. 192. Methods of marking position of buttonholes.

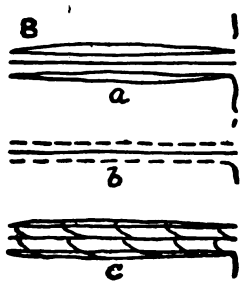


Fig. 193. Methods of stranding buttonholes (*a*) and (*b*); *c* overcasting buttonhole.

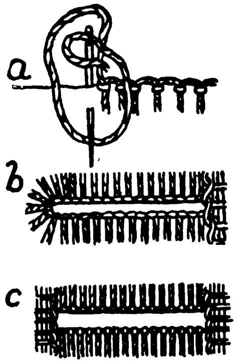


FIG. 194. Types of buttonhole stitches: *a* buttonhole stitch; *b* buttonhole with fan and bar; *c* double-bar buttonhole.

ments and outer garments. To make this placket, cut a lengthwise strip of material twice the length of the placket and twice the desired width of the facing plus the seam (1½ to 2 inches). Place the right side of the facing to right side of garment, and baste with narrow seam around the entire opening. Stitch by machine, holding garment on top to avoid stitching in folds of material. Crease the strip of material into place, as a bound placket would be. On the back of the placket cut the facing away one eighth to one quarter inch beyond the center crease. Turn in one eighth to one fourth inch on edge and baste facing down to garment. Hem or stitch the facing and stitch diagonally across the lower end to make firm.

Shirtwaist sleeve placket. Cut the opening as long as desired—usually 4 inches long and 1 inch from the fold on the under side of the seam. On the underneath edge sew a narrow strip with a seam on the right side, turn the edge under as for facing and stitch back on right side of sleeve. The overlapping part is longer than the placket and wider than the underfacing. This part, like the under part, is sewed with a seam on the right side, turned and stitched down on right. This part may be shaped or not at the upper end.

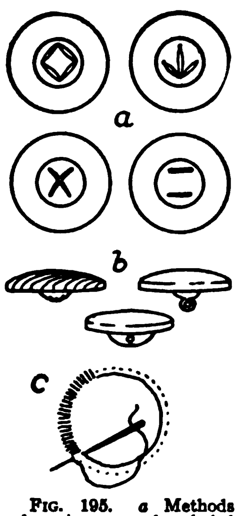


FIG. 195. *a* Methods of sewing on a four-holed button; *b* shank buttons *left*, cloth shank, *right*, metal shank, *bottom*, bone shank; *c* eyelet for shank button.

Methods of Fastening Garments

Buttonholes should always be made on double material on the right side of the garment. Use thread not too coarse but suitable for the weight of the material and long enough to complete all steps in the work, which are as follows:

1. *Cutting*. First select the size of the button to be used and cut the hole accordingly. Buttonhole scissors are very convenient for cutting the holes. If these are not at hand cut the hole thus: Fold the material, and mark with a pin from the fold of the material half the width of the button. Then cut the folded material to the pinhole, the cut being made along the threads of the material.

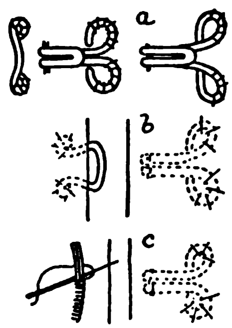


FIG. 196. Methods of sewing on hooks and eyes: *a* hook and straight eye; *b* hook and round eye; *c* sewing on hook and making thread loop.

2. *Stranding* is the second step in the making of the buttonhole. It is a succession of running stitches placed along the sides and is used to add strength and also shape. The stitches may be as long as the size of the hole requires.

3. *Overcasting* is used in making buttonholes in material which ravels. This stitch is made just like the overcasting for raw seams, being careful to take the stitches as shallow as possible and not to draw the thread.

4. *The buttonhole stitch* is made by inserting the needle just beyond the stranding threads, bringing it to the right side of the garment. When the needle is half through the material, pass the thread from the eye around and under the point of the needle from right to left. Draw the needle through and away from the worker so the purl of the stitch may be along the cut edge. Keep the stitches as nearly the same depth as possible.

There are two finishes which may be used for the ends of the buttonhole: (a) the fan and (b) the bar. The *fan* is made in the end of the buttonhole where the button will rest by continuing the buttonhole stitches in a circular shape around the end of the hole. The *bar* is usually used in the opposite end from the fan to prevent the tearing of the buttonhole. This is made by taking 2 or 3 running stitches across the end to be barred, and then applying the blanket stitch.

Buttons. When the buttonhole is made, find the place to sew on the button by lapping the end of the band or plait as desired and sticking a pin at the outside end of the buttonhole. Remove the pin and fasten a double thread at this place with several small stitches. Put the needle through one of the holes, place a pin on top of the button and sew back and forth across the pin. Remove the pin, then wind the end of the thread around the loose threads between the button and the cloth to make a stem. This protects the button from pulling off in the wash and prevents its tearing the cloth.

Hooks and eyes. Place the hook on the

right side of the opening, the eye on the left, each far enough back so they will not show when the garment is fastened. Sew neatly around the circular ends of both and tack across the hook shanks to keep them in place. The blanket stitch may be used at the circular ends, but the added neatness and strength scarcely pay for the extra time expended.

Snap fasteners are sewed neatly and securely with several over and over stitches.

Eyelets are made by punching a hole in the material with a stiletto or other round, pointed tool, and strengthening the edges by either (a) overhanding closely, (*b*) using the buttonhole stitch with purl on outer edge; or (c) with the purl on the inner edge.

Loops are made by tacking 3 or 4 stitches back and forth the length desired for the finished loop. The ends are fastened securely and the threads completely covered with the blanket stitch. These stitches should be very close together to strengthen the loop.

Stitches used in mending. Every woman should practise economy by mending and darning worn garments of the family wardrobe, thus lengthening their life and improving their appearance. It should be a matter of pride with every girl that her wardrobe is kept in absolute repair.

Holes may be repaired by either patching or darning. Patching is reinforcing holes or worn places with cloth; darning is reinforcing them with threads. Whether a patch or darn is used depends upon (a) size of hole, (b) garment to be mended, (c) material of garment.

There are 2 types of patches—the hemmed and the overhand patch.

The *hemmed patch* is used principally with wash materials. To make it crease the material along the thread or figure, equally distant from the center of the worn place, forming a perfect square or rectangle. Place pins at the four corners, and cut the material diagonally to the pins, turning the edges to the wrong side. Baste these edges in place. Place the material which will form the patch underneath the hole, matching the warp and woof and the design (if figured), and baste carefully. On the right side sew the patch to the garment with small hemming stitches. On the wrong side, cut away the extra material from the garment, trim the patch evenly all around and hem the patch into place.

The *overhand patch* is used a great deal on woolen and silk materials where there is little strain. As in the hemmed patch, cut away the worn part and turn and baste the edges. The cloth for the patch is then carefully matched in pattern and threads, and creased to fit the hole exactly. Then it is folded back on the material of the garment, basted, and the overhand stitch applied in order that the straight stitch may be imbedded in the threads of the material. To prevent raveling, the raw edges on the wrong side are finished with the overcast stitch.

Darning is used for mending tears and worn places, as well as holes. In mending tears, one must consider the position of the tear in regard to the warp and woof. If the material is woolen or silk, the mending thread should be, if possible, of the same. The running stitches which are used should always follow the weave of the material.

Stocking darning should be done with thread as nearly as possible the weight of the stocking itself. The frayed portion of the hole, which will cause unnecessary thickness, should be cut away. Running stitches are used in this mending, the work always being done on the wrong side. The use of a darning ball facilitates the work.

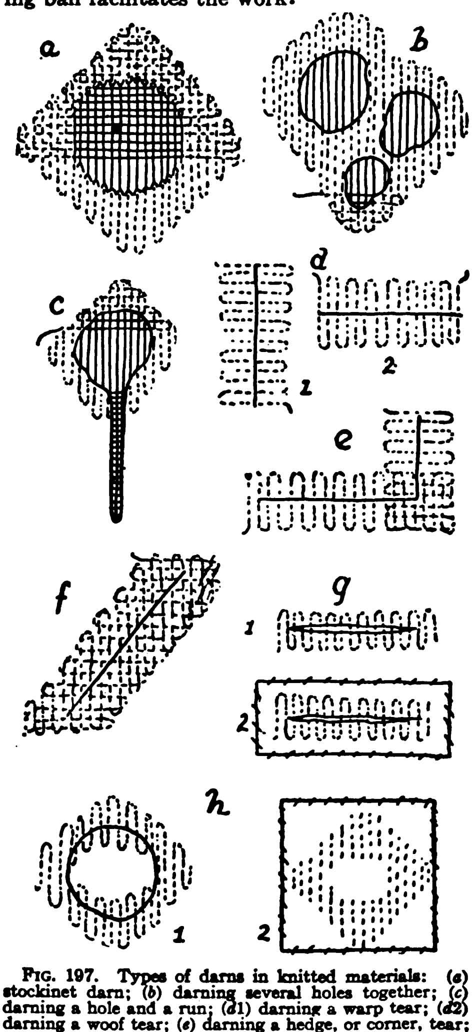


FIG. 197. Types of darns in knitted materials: (*a*) stockinet darn; (*b*) darning several holes together; (*c*) darning a hole and a run; (*d*1) darning a warp tear; (*d*2) darning a woof tear; (*e*) darning a hedge, or corner, tear; (*f*) darning a diagonal tear; (*g*) reinforced darned tear: (1) right side, (2) wrong side; (*h*) reinforced darned hole: (1) right side, (2) wrong side.

Fancy Sewing

(*By* MRS. H. J. KEYES)

In the farmhouse, where toil is constant and hard, and where the laborers need the most refreshing rest, beauty has a special service to perform. How much easier to work in, how much lovelier to rest in, is the home which has been adorned with the handiwork of its women! The embroidered cover, or doily, or curtain makes the house into a home, just as words and acts of affection do. It is like a caress, softening the harder lines of utility and duty.

The more we know about anything, the more interesting it becomes to us; so, the more we know about embroidery, the more deeply do we enjoy doing it. Although the simplest of work upon the cheapest of materials is worth while if it gives pleasure to the worker and to the members of the home where it is used, still needlework may become far more fascinating and beautiful if we can take time to study, even if a little: (1) The laws of good design; (2) the use of color and shadings; and (3) the effects produced by different stitches, the materials on which they look well, and the threads with which they are best worked.

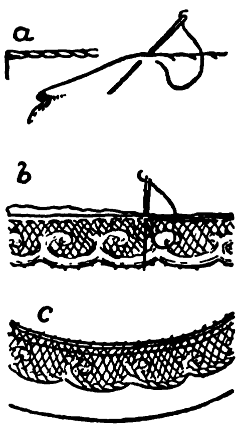


FIG. 198. Decorative lace work: *a* rolling and whipping; *b* whipping over raw edges; *c* appliquéing lace, wrong side.

Design. You can not make a good picture with embroidery. The best patterns, therefore, are those which do not try to copy exactly, so that they look real, the flowers, birds, bees, etc., which are to be worked. The pattern should merely suggest these, reducing the drawing of them to the boldest, most important lines, and keeping them flat-looking instead of rounded like the objects themselves. This is the difference between pictures and decoration. Embroidery is done for the sake of decorating useful objects with graceful lines and pleasing colors, not for the sake of making pictures. Roses on the bureau covers should not look as if they ought to be picked up and put in water, nor should bees on the centerpiece look as if they would sting.

Colors. Because embroidery is decorative, not pictorial, we need not imitate the color of the object suggested in the color of the thread. Nothing is handsomer than heavy blue or soft green embroidery on table damask, and white on white has special charm. In using silk thread, the delicate shades are better than the heavy ones so effective in linens and mercerized cotton. Whatever thread one is using, 3 or 4 shades may be combined, and the effect is far stronger when these are not too delicately blended, but are blocked in boldly like the strong patches of light and shadow made by sunlight.

Materials and operations. A square frame to which the work is laced is better than the common hoops, which stretch the material into forms like themselves and injure the stitches which may have to be confined between the 2 hoops. If the square frame is on a stand it leaves both hands free for sewing. An old thimble worn smooth is excellent, especially in working with silk. Needles should have large eyes so that the thread will not be roughed up in passing through them.

To trace a pattern, draw it on butter paper, then, with an unthreaded needle on the machine, prick the outlines. Baste this on your cloth and sew through it, tearing it off when finished.

To copy a piece of embroidery already finished, lay your cloth on a padded ironing board, dampen the embroidery and baste it, design down, on a piece of cloth laid over your material. Lay a thin cloth over all and then press them till dry. Your new cloth

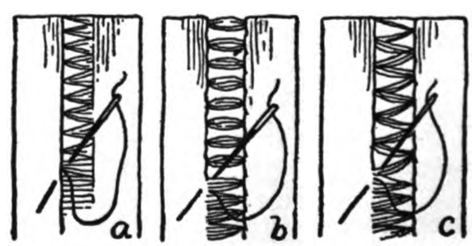


FIG. 199. Various types of hemstitching: *a* hemstitching; *b* double hemstitching; *c* diagonal hemstitching.

will show the pattern, which you can outline with a pencil.

Stitches. There are several families of stitches, the members of which resemble each other and are capable of doing certain things and incapable of doing others, a good deal like the members of human families. Just as a household of musicians if asked to cultivate a farm would probably raise poor crops, so the various canvas stitches, for instance, if placed on silk or muslin would be unsuccessful, whereas they are very decorative on materials of coarse, open weave.

The embroiderer ought to learn these families of stitches and experiment with them till she knows to what materials and threads they are suitable and with what other stitches they will combine handsomely. Then, before beginning a piece of work, she can plan it out definitely, which is far safer than to change stitches haphazard as she goes along. Simplicity is a wise rule, however, and the use of few stitches is better than a confusion of many. As there should never be more than one kind of thread in one piece of embroidery, the combination of stitches is limited to those which look well in a certain thread.

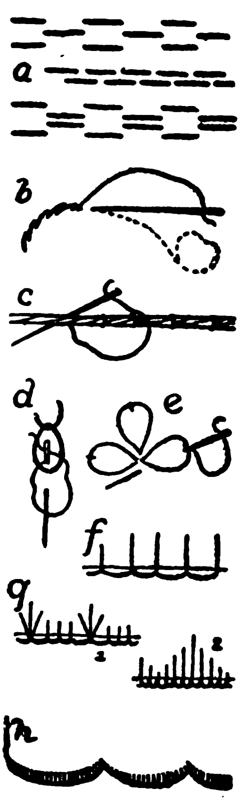


Fig. 200. Embroidery stitches: *a* decorative running stitch; *b* outline stitch; *c* couching; *d* chain stitch; *e* lazy daisy; *f* blanket stitch; *g* variations of blanket stitch; *h* scalloping stitch.

Embroidery stitches may be described as follows:

The *cross stitch* may be made over the threads in loosely woven materials such as scrim or canvas. In fine materials, canvas must be basted into place, the stitches made over this and the canvas removed; or if a pattern is stamped upon the material, no canvas is needed. The stitch is made by taking the needle from the lower left-hand corner of the square to the upper right-hand corner, making a slanting stitch. Then a stitch is taken on the underneath over to the upper left-hand corner, brought through the material to the lower right-hand corner, making a second slanting stitch which crosses on top of the first and completes one cross stitch. The needle is again brought up at the lower left-hand corner of the next square, and so on.

The *chain stitch* is used for outlining, or for filling in spreading patterns over large surfaces. It is done with twisted silk on heavy goods; or with flat-silk floss, linen, or mercerized cotton on flimsy materials. In making this stitch, a succession of blanket stitches are made one after the other. *The lazy daisy* is a variation of the chain stitch. Two stitches only are needed for each petal of the daisy. The first is a chain stitch, the second is taken through the material to hold the first in place.

The *outline stitch* is made on a line from left to right, the stitch being longer on the right side than on the wrong side. The thread must be thrown on the same side each time in order that the effect will be regular.

The *feather stitch* is used for border work, outlines, or for filling in geometrical patterns. It is very effective as trimming for clothes. The thread should match the material as nearly as possible. It is made with a slanting stitch toward the center, first on the right and then on the left side. The brier stitches are made more parallel but are made alternately on the right and left.

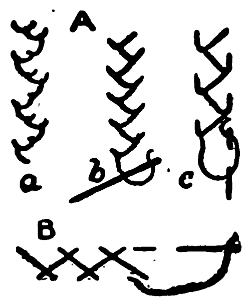


Fig. 201. A, Types of featherstitch: *a* double; *b* single; *c* coral. B, cross-stitch.

The *French knot* is made by bringing the needle through the material where the knot is desired, the thread thrown over and under the left thumb, or over the needle, making a loop, the loop pulled down to the material and a small back stitch taken, bringing the needle out where the next knot is to be. French knots are very attractive used either alone or in combination with other stitches.

The *satin stitch* is used on materials of all kinds, but particularly fine ones, including silks. It is done with flat cotton or linen threads or silk floss—never with tightly twisted threads. It is most beautiful for flower designs, giving brightness and luster to the surface. The satin stitch usually has as its foundation the chain or outline. If the material is especially sheer, each stitch is the width of a thread apart. The padding is always made at right angles to the direction in which the satin stitches are to be made.

Darning is a succession of parallel rows of short regular stitches, done with any loose, flat thread. It combines well with the outline or satin stitches, and fills in a background handsomely, in which case the pattern may

be produced by darning round it and leaving the design of free material; or to fill in a pattern. In this latter way it is beautifully used in a lace mesh.

Couching is a decorative stitch which may combine different shades or colors very attractively. Two threads are used in making it. One is held in place on the material with the right hand; the second is used in making the stitches which hold the first thread in place. These stitches are made over the first thread and at right angles to it, and one fourth to one half inch long on the wrong side.

The *blanket stitch* is an edge finish. It is begun with several small running stitches taken at right angles to the edge of the material, bringing the needle out as near as possible to the edge. The work proceeds from left to right. For the first stitch the needle is placed in the material a short distance from the edge—one eighth to one half inch according to the materials. The thread is thrown under the point of the needle from left to right and the needle drawn through toward the worker. Each succeeding stitch is taken in the same way, the distance desired to the right of the stitch before and the same distance from the edge.

Laundering of Household Fabrics

(*By* Mary Elizabeth Robinson)

One of the hardest tasks confronting housewives is the weekly washing; yet if a thorough study is made of laundry principles and the house is equipped with labor-saving laundry devices, the work need not prove burdensome. The time will come, let us hope, when every farmhouse will have a laundry room fitted with stationary tubs, faucets and drain pipes, and the washing machine will be operated by an electric motor or a gasoline engine. While this happy time is still on the way, wise women will make some study of the different fabrics to be laundered, just as they study them in relation to sewing practices.

Wool fibers vary in length from 1 to 11 inches. When examined under a microscope, they are seen to be composed of small segments called cells, with hook-like, overlapping edges forming a characteristic horny layer. When woolen materials are wet, the fibers expand and the projecting edges loosen. As the fabric dries, the little hooks interlock, drawing the fibers close together so that we say the garment "shrinks." With careful washing, this shrinkage is slight. It is increased by the use of very hot water, or by a change from hot suds to cold rinse water. Both wash and rinse water should therefore be the same temperature, which should not be more than comfortably warm to the hands. Much rubbing, or ironing with a hot iron will also increase shrinkage, as will the use of strong soaps or other alkalies. Mild soaps or weak solutions of borax are only slightly harmful.

Silk is the most delicate of all fibers. It is spun as one long, continuous thread by the silk worm and is lustrous and elastic. Silk, like wool, is completely destroyed by strong alkalies. Hot water, strong soap, hard rubbing, and ironing with hot irons must be avoided with silk as with wool. A hot iron yellows silk and causes the fiber to stiffen and sometimes break.

Cotton fiber is a ribbon-like, flattened, twisted tube varying from three fourths of an inch to 1 ½ inches in length, according to variety. The slight twist gives the fiber its valuable spinning qualities.

Linen is a fiber found in the inner part of the stem of flax, and is identical in composition with cotton. Alkalies have very slight effect on either, though if strong soaps are continuously used, the garments may be yellowed and the fibers gradually weakened.

Cleansing agents. Soap and water, air and sunshine are the only indispensable cleansing agents, and as soap is cheap and the other three are free, there is no reason why every one cannot have clean, white clothes. Every woman knows that hard water is not desirable for washing purposes. Water is hard because it contains mineral matter dissolved as the water flowed along underground. These minerals combine with soap to form

FIG. 202. A glass rod is useful in removing stains with chemicals. Use a pad of cloth or paper beneath the goods.

a scum, and the soap will not lather till enough has been put into the water to unite with all the mineral it contains. Hard water, then, is worse than an inconvenience; it is an extravagance because of the soap it wastes, for cleansing does not begin till the soap lathers. Soaps are compounds made by the action of strong alkalies on fats. The cleansing power of soap is due to the fact that soap decomposes when brought into contact with water, and the alkali thus set free dissolves or cuts the grease and other dirt, while the fatty acid entangles the impurities so that they are carried off in the water. A cheap soap is no economy for it usually contains such strong alkalies that in time it will wear the clothes into holes.

There are various methods of softening hard water. If the mineral contained is only carbonate of lime, the water may be softened by boiling it and letting it stand till the lime settles to the bottom. Boiling has no effect on other minerals usually found in water, and water containing them is said to be permanently hard. Probably the best alkali to use for softening such water is washing soda (sodium carbonate, or sal soda, as it is sometimes called). It is best to make a solution of the washing soda by dissolving 1 pound of it in 1 quart of boiling water and to keep this on hand bottled for use as needed. Allow 2 tablespoons of this solution and 1 tablespoon of borax dissolved in 1 cup of water to every gallon of wash water. A number of washing powders and preparations for softening water are on the market, but they are usually more expensive than the substances already mentioned, and are likely to be so strong as to injure the fibers of the garments washed with them. If washing powders are used they should never be put on the clothes dry or sprinkled carelessly into the tub. Dissolve the powder in a little water and add it to the tub of water before the clothes are put in.

Bluing is used to whiten yellow garments. Since blue and yellow are complementary colors, when mixed in the proper proportions, they give the effect of whiteness. If garments are washed properly, well rinsed and then bleached in the sunshine, no bluing should be necessary. Many housewives use bluing, therefore, only to cover careless washing. The best form of liquid bluing is made of aniline dyes. Prussian blue is used extensively but as it is an iron compound, it causes the clothes to become yellow if not thoroughly rinsed. The soap left on the clothes decomposes the bluing, leaving iron; the housewife then wonders how it happened that iron rust got on the clothes. The better qualities of bluing are finely ground, but cheaper ones are often coarsely ground and their particles sticking to the fabric, cause streaks. With bluing, as with soap, it is economy to use the better grades. If we wish to test whether any bluing is an aniline dye or an iron compound, we may mix a little of the dissolved bluing with some of the washing soda solution. A reddish brown or yellow color indicates the presence of iron.

In starching clothes much trouble is avoided if the starch is thoroughly cooked before using. Borax, alum, paraffin and gum arabic are sometimes mixed with the starch to prevent the iron from sticking. These will also improve the color and give pliability to the cloth. Rice starch is superior to corn starch for lawns, fine muslins and laces.

Equipment for laundering. Not all houses can have a room set aside for a laundry although this plan is ideal. A basement room is splendid if the floor and walls are dry and there is provision for an abundance of light and air. The laundry stove, tubs, water supply and waste pipe should be arranged so there will be the fewest steps necessary in going from one process to another. In bad weather, clothing may be dried in this room. In many homes the back porch serves for a laundry in pleasant weather, and the kitchen during the winter. In such a case some special place, such as a closet, should be kept for laundry equipment and supplies so that these will always be at hand and in good condition. When equipment is carelessly kept or scattered about, needless work is added to washday.

A good water supply is one of the greatest

FIG. 203. In removing some stains the chemicals may be dropped upon the goods by stretching it over a bowl of clean water.

blessings on the farm, especially on washday. Where water for the weekly wash must be pumped by hand, carried to the tubs and emptied, it will surprise any woman to calculate how many pounds she lifts during the day. Where a regular water supply is not installed, a force pump and a piece of hose will be of help in filling tubs and boiler.

Stationary tubs are unfortunately an exception in the country. Wooden tubs are insanitary and must be kept in a damp place to prevent their leaking. A good quality of metal tub will prove satisfactory. It should be dried carefully after being used. Where no washing machine is used, three tubs are necessary.

A bench on which to set the tubs may be bought or made at home. See that it is of a height to prevent stooping and that it is so placed as to get good light.

The washboard must be of good quality else it will wear, break and tear the clothes. The use of a small brush in cleansing badly soiled clothes will save the hard and destructive rubbing on the washboard.

A good copper-bottomed *boiler* is expensive, but it will last many times as long as one made of tin.

Buy a *wringer* with hard-rubber rollers and good springs. When not using it, loosen the thumbscrews which control the pressure, and wipe the rollers dry.

A wicker *basket* is light, easily handled, and may be kept spotlessly clean.

Have a plentiful supply of *clothespins*, and keep them in a clean bag. An apron bag is convenient or a bag made on a clotheshanger, which may be hung on the line and slid along as needed. Drop the clothespins in the boiler of water occasionally to remove soil or smut.

The line, if of wire, should be non-rustable. See that no broken and mended ends are left to catch in the clothes. Wipe off carefully with a damp cloth before using. A rope or cord line should be taken down when not in use and occasionally washed.

An excellent type of folding *ironing board* adjustable to various heights may be bought, or one may be made and attached to the wall so that it folds up out of the way when not in use. Have it well padded with an old cotton blanket, outing cloth or cotton batting. Covers of heavy white material should be made large enough to cover the board with several inches to spare. Tie on with tapes so that a clean cover may be quickly adjusted. A small board for sleeves and children's clothing is a help.

Electric, gasoline or alcohol *flat-irons* may be had which do good work. Of the type which must be heated over the fire, many people prefer the bright irons with detachable handle, but the old-fashioned steel irons with handle attached hold the heat longer. Do not leave irons sitting on the stove when not in use. Keep them put away where they will keep clean and not rust. Iron once overheated will not hold heat well afterward. Rub a hot iron on coarse salt to remove roughness. Keep the *iron holders*, *stand*, and *wax* together.

A *clothes rack* is very convenient for airing ironed clothes.

Starch kettle, *spoon*, *buckets*, etc. are usually borrowed from the kitchen.

Renovating Millinery Materials

Velvets. Brush, dampen evenly on wrong side, and steam over a medium hot iron. This freshens the velvet, and raises the pile.

Silks. Dampen evenly with slightly warm water and alcohol (1 tablespoon alcohol to 1 pint of water). Press carefully between papers. Mild, white soap may be added to water if a stiffer silk is desired.

Woolens. Gasoline, benzine, chloroform or tepid water and mild, white soap applied in solution.

Flowers (retinting). For cotton use water colors. For silk or velvet use oil paint and gasoline.

Feathers (ostrich). To recurl, use dull knife or steam. To retint, use oil paint and gasoline.

Straw hats and Panamas. Wash with warm water and mild, white soap applied with stiff brush; rinse. Bleach with peroxide of hydrogen, sulphur applied in form of paste, or lemon juice and salt.

Leghorns. Wash with warm water and white soap.

Milans and Chips. *White*. Clean with art gum; if sunburned, bleach with peroxide of hydrogen. *Black*. Brighten with ammonia; retouch with shoe polish. Any light-colored shades may be retinted with hat dyes, or blackened with shoe polish.

HOUSEHOLD PESTS

(*By* Mrs. Helen Johnson Keyes)

Some of the pests discussed here are not, in the strict sense of the word, household pests. However, the farm family may have to contend with them, and for this reason, a rather broad treatment seems best.

The farm and the farm home are constantly confronted by the necessity of getting rid of destructive forms of life. The best and safest way of destroying these pests is a matter of great importance.

THE CLOTHES MOTH. This is one of the most expensive of our household enemies, but one of the easiest to defend ourselves against. There are two kinds of destructive clothes moths, the case-making one of our northern states, which lays its eggs only once a year, in the spring; and the webbing moth of the South, which breeds in May and again in August and September. The northern housewife, therefore, has to fight against moths only once a year, when it is about time to lay away winter clothing. In southern localities the fight against them is almost continuous.

Only the larvae of the moth, the dull white caterpillars, destroy our clothing. The adult insect is harmless except as a layer of eggs.

First, the adult moth seeks a quiet, dark place to lay her eggs. She likes a greasy spot on some substance which the larvae will eat. Moth larvae will eat only animal food, such as wool, silk, furs, and feathers. They will have nothing to do with vegetable fabrics, such as cotton and linen. So the mother seeks our most expensive clothing and furnishings for the cradle and food of the creatures which are to hatch from her eggs. Not only this, but the larvae themselves have the power of crawling about and finding their own food if they are not cradled in it. When moths lay their eggs in cracks and crevices of floors, closets, trunks, and other storage places, the larvae creep out and hunt for what they want to eat.

Our war against moths, therefore, is of two kinds: (1) Prevention, or so caring for our things that no eggs will be laid in them. (2) Destruction of the eggs or larvae, which must be resorted to if prevention has not been successful.

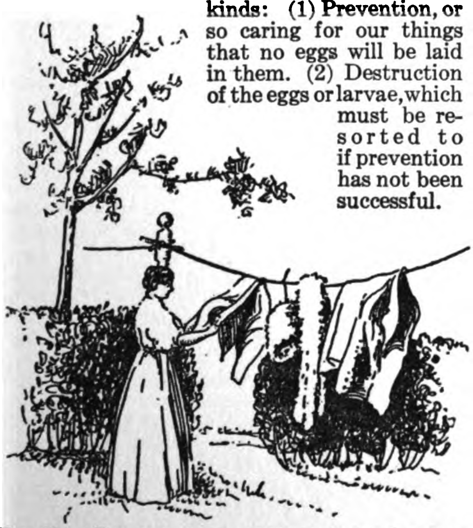


FIG. 204. Frequent airing and thorough brushing are the best preventives of moths

Prevention. In the early spring, fabrics made from animal substances should be taken into the direct sunlight and thoroughly brushed, and in case of furs, even combed, to cleanse them of any moth eggs which may have been deposited in them. They can then safely be put into sealed packages, bags, or boxes and kept there till autumn without the addition of those pungent odors—camphor, naphthaline, moth balls, tobacco and pepper—which are commonly used. Because adult moths have no power to bite, they may be kept off by paper, cloth or wood if all the cracks in these materials are sealed. Paper packages thoroughly sealed are entirely secure, but as paper tears readily, it is safer to put such bundles into boxes and to close the cracks of the boxes with strips of paper fastened down with flour paste or other adhesive material. The easiest way, however, is to make a number of unbleached cotton bags, lay the cleansed garments in them, tie them up tightly, mark them with what they contain, and lay them on shelves or in drawers, or hang them in closets.

The method that we have spoken of does not require any disagreeable odors. The odors which are commonly used do not kill eggs or larvae, they merely keep away the moth that is seeking a spot to lay her eggs. They do just what a sealed package or tightly closed bag does—they keep her out.

Destruction. Gasoline, benzine, and naphtha destroy eggs and larvae, and may be applied to furs, feathers, woolen, and even silk fabrics without injuring them. The things must be dried thoroughly, however, before being packed away or brought near a flame. The fact that petroleum products easily explode or catch fire, must be kept in mind or terrible accidents may result.

To avoid these dangers, the following recipe which has the advantage over many other moth poisons in being harmless to children and household pets, may be used in the cleansing of cracks and crevices: Alum, 4 ounces in 1 pint of water; salt, 4 ounces; spirits of turpentine, half a pint.

It is well to repeat these treatments frequently during the spring and summer seasons.

THE CARPET BEETLE OR BUFFALO MOTH. This beetle, like the clothes moth, destroys woolens when in the larvae state, and has a particular affection for carpets, which it eats in slanting lines. As an adult, it is black and white with a red stripe down its back, and is less than a quarter of an inch long. This is about its size, too, as a caterpillar.

Prevention is best accomplished by doing

away with carpets, and using movable rugs on finished floors.

Carpets must be taken up, soaked in benzine and hung in the direct sunlight all day. All floor-cracks and baseboards must be washed in an alum, salt, and turpentine mixture. A heavy tar paper should be spread over the floors before the carpets are laid again, if it is necessary that they should still be used. Several such cleanings will probably be required before the creatures are destroyed. One cleaning in the middle of the summer is particularly effective.

BEDBUGS. Bedbugs are small, reddish, flat insects, with an offensive odor. They infest not only beds but walls, creeping out after dark and making their meals upon sleeping people. They are known to carry the germs of certain diseases, particularly those of typhus fever.

Cleanliness is the best preventive. Bedsteads should be kept free from dust and frequently washed with a cloth wet in kerosene. Particular care must be given to joints and cracks, into which boiling water and kerosene ought to be poured as an occasional preventive. The places under the tufting and along the binding of mattresses need to be kept dustless and constantly examined with suspicion. In repapering rooms, a new paper should never be laid over the old one, but the walls should be scraped and then washed down with 2 pounds of alum in 3 quarts of boiling water.

There are several excellent bedbug exterminators on the market. An equal mixture of kerosene and turpentine is also good, and there are various recipes for the combination of corrosive sublimate with alcohol, camphor and turpentine. Corrosive sublimate, however, is such a deadly poison that it is best to avoid its use. Whatever mixture is selected, it should be forced into the cracks of furniture and woodwork and under the tufting and binding of mattresses with a spray apparatus, which costs but little. A thick coating of hard oil varnish, laid with a soft, small brush upon bedsteads, springs, and woodwork, is an excellent exterminator. In the case of metal bedsteads, a drenching with kerosene, which is then set on fire and allowed to burn out, is a new and effective method, but, of course, it requires great care.

FIG. 205. In destroying buffalo bugs carpets must be taken up and floors (especially the cracks) well treated with an alum, salt and turpentine mixture.

Destruction should always begin when the first bug is noticed. They multiply very rapidly, and the neglect of the first proof of their presence may result in their overrunning the house, in which case complete "doing over" of several rooms may become necessary, including painting, whitewashing and papering.

COCKROACHES. Cockroaches are large, dark-brown beetles which love damp, filthy places around water-pipes in the insides of houses.

Absolute cleanliness and sanitary arrangements which leave all damp places open to the sunlight, are almost sure preventives.

There is no better poison than powdered borax mixed with powdered sugar and scattered all over their runways and forced with bellows into the cracks and crevices. It kills them, but is harmless to people and to pets. A mixture of 3 parts of flour with 1 part of plaster of Paris is effective. Set a low, flat dish containing this mixture where the roaches can reach it, and near it place a saucer of water.

Whatever destructive measures are used, the roaches will return constantly unless all dark, damp places are done away with and all damp cloths, mops and so forth hung out in the sunlight.

BLACK AND RED ANTS. These little creatures sometimes become so numerous that they are the despair of housewives, swarming over foodstuffs, particularly meats and sweets.

Powdered borax, gum camphor, or red pepper kept near the food will drive them away. They are not likely to climb on shelves or tables, or to enter refrigerators or drawers which are frequently washed in carbolic soap. A further precaution is to place the legs of tables and refrigerators in pans of water over which is poured a tablespoonful of kerosene. They will not go beyond these.

They may be trapped by baiting thread or sponges with molasses and burning these when the ants are swarming on them. Many other ants, however, will come to the funerals, and the only thorough method is to destroy the nests. Locate these by placing coarse sugar where the ants will find it. Soon they will begin to carry loads to their homes. Take up a few boards or stones where the ants are seen to enter, and find the nests, then inject an ounce or two of carbon bisulphide and cover it up solidly with earth. The nests of red ants are usually in the walls or floors of houses, those of black ants under stones in the yard.

The carbon bisulphide will spread out into all parts of them and destroy the colonies. It is not expensive. Care is necessary in the use of carbon bisulphide in a closed room, as the gas formed is highly explosive when it comes in contact with fire.

WHITE ANTS. These are not ants at all, though they look like them and in many ways act like them. They are common in all parts of the United States, but they do their worst damage in hot, moist localities. They are vegetarians, eating decayed wood, paper, books, and other material. They enter these and eat from the inside out, so that their food sometimes crumbles into powder before an "ant" is seen.

New buildings in places where these insects work should be set up on cement or stone foundations, and approached by gravel or asphalt walks, not board walks. Exposed timber and wood should be sprayed frequently with creosote. Paper must not be allowed to accumulate and books ought to be frequently examined.

The only method of getting rid of these pests seems to be to fumigate with hydrocyanic acid gas. (See Vol. II, p. 511.)

CHIGGERS though not really household pests, frequently prove very annoying to the members of the household. Not only are these little trouble-makers found on the grass and weeds in pastures or timbered tracts, but also sometimes on well-kept lawns.

Take a bath in hot water, to which strong soap or salt has been added, very soon after exposure to chiggers. However, after the lapse of a few hours, and after irritation has set in, such a bath will do no good. To treat each red spot with a strong solution of ammonia will then help. A well-saturated solution of bicarbonate of soda, or common cooking soda or saleratus may also afford relief. Where the suffering is very bad, a dilute tincture of iron or collodion should be applied.

MICE. With mice, as with many other pests, it is easier to keep them out of the house than to get rid of them once they are in. So the house should be built so as to prevent mice from getting in. Where there is a basement under the house, the windows should be screened as mice often get into the upper part of the house by coming from the cellar. Rat and mouse guards should be put in the walls at each floor so as to prevent these pests from climbing up between the walls.

In old houses and others that are not entirely mouseproof, nothing in the way of food should be left exposed to mice. Surplus meat left in the pantry, popcorn, beans and peas and dried seeds, unless covered or hung out of reach, are almost sure to attract mice. Keep all trash and rubbish cleaned up. Use the little spring traps, baiting with cheese, whenever a mouse is known to be in the house.

FLEAS. In many places, especially where hogs and other live stock are bedded in buildings near the farm residence, fleas become serious pests. On some farms, fleas are so numerous during the summer months that it is almost impossible to make the ordinary use of barns, stables and other outbuildings where stock is kept. Not only do the fleas prove a great annoyance to the men whose work takes them into the farm buildings, but getting into the clothing, the pests are carried to the house. In this way the whole family is annoyed. Dogs also carry the fleas from stables and sheds to the farm residence.

Once a farm building has become filled with fleas, getting rid of them is no easy matter. For the sake of the comfort of the family, the first thing is to prevent the pests from getting into the dwelling house. Dogs and cats frequenting buildings where fleas are plentiful must be kept away from the family residence, even off the porches. Nor must the children be allowed to play with these pets, which should be bathed occasionally in water containing about a dozen teaspoons of creolin to the gallon, or dusted with Persian powder. When fleas are very bad in the barns, it is often best for the man who has to look after the stock to change his clothing before going into the house.

The first thing to do in ridding a barn, shed or stable of fleas is to clean up. All rubbish and bedding should be removed and burned.

FIG. 206. Rats are not only a source of loss but also of great danger, on account of the diseases they carry.

If manure has been allowed to accumulate, it should be hauled out. Floors, partitions and other woodwork should be thoroughly sprayed with a coal-tar or carbolic-acid mixture. It may be necessary to spray several times. Use whitewash wherever possible.

After the building and surroundings have been thoroughly cleaned, they must be kept clean. Doors and windows should be opened so as to let in plenty of air and sunshine. Where a clean-up is undertaken, it will do but little good unless it includes all the buildings where fleas are known to be bad.

RATS. The rat not only destroys property to the value of many thousands of dollars each year, but also endangers human life and public health.

Rat riddance is no easy matter, as the pests go from farm to farm and from neighborhood to neighborhood. The means for ridding a farm of rats may include: (1) driving out the rats, killing as many as possible and destroying harboring places; (2) starving, in so far as can be done, by rat-proofing cribs and bins; (3) trapping, poisoning, and using rat dogs; (4) preventing multiplication.

FIG. 207. The snap or guillotine trap is a most effective rat catcher.

Almost every one who has lived long on a farm, especially in the corn belt, can recall some day when the men and boys on the place joined in a general rat killing. On the day when such a big drive is made, rats are dug out wherever they are found, provided it is possible to get to the runs. Where the harboring places cannot be reached, unslaked lime or chloride of lime is placed in the openings. For killing rats by wholesale in their homes in the ground, carbon bisulphide is the best agency known. Put in the runs, which are then closed, it forms a deadly gas. It should, however, never be used in or about buildings where there is fire, as it is both explosive and inflammable.

Rat-proof buildings. With the passing of the log barn and the wider use of cement in barn building, rats are not as great a nuisance as they once were. The full concrete foundation and rat-proof cribs and granaries are making the farm buildings less inviting to rats. The wider use of coal as fuel and the displacement of the old-time rail fence, with surplus rails piled about the lots, are also helping in the fight against rats. Where cribs, granaries, meat houses and poultry houses are not made rat-proof, the floors should be some distance above the ground so as not to make hiding places for rats.

Trapping and poisoning. Rats are often cunning and suspicious and hard to trap. However, with so many kinds of traps on the market, it is possible to catch many of the pests. The first thing in trapping rats is to cut off the natural food supply just as far as this can be done. The next thing is to set the trap as it should be, first being careful to remove any odors which might tend to keep the rat away. If the trap is new or if rats have just been caught in it, a good plan is to hold it in a dense smoke in order to take away the odor. Some trappers make use of a single drop of oil of anise or caraway to scent the bait or trap. Various baits, such as fish, cheese, bacon, scraps of raw or cooked beef, and even vegetables, are used. It is well to use various kinds of bait and to provide some food that the rat is not getting in its daily foraging.

Poisons, while fairly satisfactory in killing rats, should not be used except with great care. Poison must be kept out of reach of children, must not be left where grown people will get it by mistake, or where birds or domestic animals might eat it. Where poison is used it should be put well back in the run by means of a long-handled spoon.

Many kinds of rat poison are on the market. There is also what is known as the official arsenical rat poison, which has been extensively used by the Public Health and Marine Hospital service of the United States. Directions for making are as follows, but for use on an ordinary farm one tenth of the amount would probably be enough:

White arsenic, very finely powdered	4 pounds
Cheese	4 pounds
Glycerin	6 ounces
Water	1½ gallons
Corn meal	10 pounds
Black aniline	Sufficient to color to a slate gray
Oil of anise	½ ounce

Melt the cheese with the glycerin and one half gallon of the water, then add the corn meal and the rest of the water, and continue to heat until the corn meal is thoroughly cooked. Then stir in the arsenic and black aniline, and lastly add the oil of anise. It may require more or less water for the above formula, according to the amount of starch in the corn meal, but the quantities as given above are for average quality of corn meal.

It should be borne in mind that regardless of what poison is used, the dying rats may get into the walls of the dwelling, unless these are rat-proof, or even the cistern unless it is properly protected. A rat may get into or under the dwelling and die in a place where it cannot be reached. Something to destroy the odor is then in order. A compound of zinc and chlorine, commonly known as chloride of zinc, may be used. The following has also been recommended: In 1 pint of boiling water, dissolve 1 teaspoonful of nitrate of lead; next dissolve 2 teaspoonfuls of common salt in a bucketful of cold water, then mix the two. Next dip a good-sized cloth in the mixture and hang in the room.

A fox terrier or other dog that is a good ratter will help in keeping a farmstead free from rats. The ferret, a small weasel-like animal useful in killing rats, has been used but little on the farm.

D. SICKNESS: ITS PREVENTION AND CARE

By BAB BELL, *who writes on Household Hygiene, and* MRS. H. J. KEYES, *who discusses the important, often vital, subject of the Care of the Sick. Because of its location, the condition of country roads, the lack of correct information on the part of its occupants, and other disadvantages, the farm home has long been out of touch with adequate medical care and attention. Conditions are now improving rapidly, partly because of the wider use of the automobile, partly because of better roads, and partly because of the spread of modern knowledge by county agents, extension departments and other educational agencies. However, the farm woman must always be prepared for emergencies; accidents will happen and trained nurses are often unavailable especially in the early stages of disease when correct attention is most important. This chapter is not a medical guide or "home physician"; it simply tells what the farm family can and should do to keep its ill or injured members most comfortable until expert care can be obtained.*—EDITOR.

Household Hygiene

(*By* BAB BELL)

Every woman who presides over a home should have a knowledge of household bacteriology, and the relation of bacteria to disease.

Bacteria, yeast, and mold are tiny plants. The reason it is difficult to keep foods is that millions of these small organisms are everywhere present. When an article of food "spoils," it means that bacteria, yeasts or molds are causing the change. The housewife should understand that diseases are caused by certain forms of such micro-organisms. One of her problems is. therefore, the control of these organisms.

Bacteria are the smallest and simplest forms of plant life known, and are the most universally distributed. There are hundreds of varieties, but fortunately only a few produce disease. Different kinds vary in size. It takes about 20,000 of the smallest bacteria to cover a pinhead. Many bacteria are harmless and may be made useful. For example, the pleasant acids of buttermilk, vinegar and sour milk are due to bacteria. Other bacteria develop in meat and fish, and produce substances known as ptomaines, which are dangerous.

Yeast plants in bulk are most familiar to us in the yeast cake which contains millions of yeast plants massed together. Yeasts are useful in bread making, and they also cause fermentation of fruits. When the yeast plants are introduced into the dough, they break up part of the sugar into alcohol and carbonic acid gas. The gas expands, and this causes the loaf to be light. The same thing happens when the yeast falls upon our canned fruits, only the fermentation ruins the taste of the fruit.

Masses of *mold* may be seen with the naked eye. The spores (or seeds) are everywhere present, and need only warmth and moisture to enable them to grow. The most familiar examples are mold on fruit and bread, and mildew on cloth.

The problem of the housewife is to control the growth of these organisms. This is possible if the following points are kept in mind:

1. With warmth, moisture, and food, all organisms will flourish; most of them also require air, but a few do not.
2. Intense heat kills all organisms; boiling temperature (212 degrees F.) will kill everything except spores. To kill spores, continuous heat for some time is required, and some spores require repeated applications of boiling temperature.
3. Cold retards the growth of organisms but does not kill them.
4. Micro-organisms (a term used to designate all organisms so small that they can be seen only by the aid of a microscope) do not develop on dry material. Moisture is necessary for their growth.
5. Most micro-organisms are killed in a few hours by direct sunlight.
6. Dust is comparatively harmless in itself, but is a means of conveyance for micro-organisms.
7. Micro-organisms cannot live in a concentrated sugar solution. This explains why fruit keeps when made into preserves, even though not sealed.
8. Micro-organisms cannot live in a concentrated salt solution, which explains why a salt pickle is successful.
9. Micro-organisms flourish in food products that contain only small quantities of either sugar or salt.
10. Vinegar, spices and wood smoke tend to prevent growth of micro-organisms.

Of what value is the knowledge of these facts to the housewife? Just this: The housewife is held responsible for the health and happiness of her family; she buys and handles the food eaten by the family, and should know the possibility of transmitting disease by foods. Also, she can apply her knowledge in other ways.

Personal cleanliness comes first. Every housewife should endeavor to maintain a high standard of dress and hygienic surroundings in her kitchen. The dress should be of wash material, rather than woolen. The hands should be well washed and the nails cleaned. When handling food, clean nails are a safeguard from disease. Caps are recommended to protect the hair from odors of cooking as well as to protect the food from falling hair. Testing by means of placing the finger in different food materials is not only dangerous as a disease carrier, but it is nauseating. Coughing and sneezing while preparing various foods, without using a handkerchief, is inexcusable. The fine particles of sputum which fly from the mouth contain germs of disease. The nail brush and hand brush should be used before mixing bread or cake. Many factories have been compelled by law to clean up, and some are cleaner than are many of our own kitchens.

The care of food in the kitchen, pantry and dining room is important. This work is greatly aided by proper utensils and conveniences. The following sanitation points should be kept in mind.

1. The kitchen, dining room and pantry should be kept as free from dust as possible. Left-overs should be properly cared for. Foods left exposed to the air, uncovered, form a good stronghold for the collection of disease-producing germs; moreover, the practice is also very unsanitary.

2. Careless dishwashing may be a means of transmitting disease. If dishes are rinsed in boiling water, drying will be unnecessary and the dishes will be partiallly sterilized.

3. Dish towels should be frequently washed and boiled.

4. Pet animals should not be allowed in the kitchen. Aside from the fact that they leave more or less loose hair and dirt, they are also known to be carriers of disease.

5. Mice and rats not only destroy foods but have also been known to transmit diphtheria and other deadly diseases.

6. The house-fly should be looked upon as the most deadly disease-carrier with which the housewife has to contend. She should make every effort to keep it out of the house, while the farmer should carry on a constant campaign to prevent its multiplying in and around the barn.

How to destroy disease-producing organisms. Disease-producing organisms may be controlled by common household methods which every woman has at her command: namely, sunlight, fresh air, soap and water, and boiling water. Some simple and inexpensive chemicals may also be used.

Generally speaking, too much importance is attached to some so-called disinfection. Recent investigations have shown that sunlight, fresh air, and soap and water are the best agents that the housewife can employ in killing germs. Of course, everything that can be boiled without injury to the article should be disinfected in that way, as boiling in water is a sure method of killing disease germs. The housewife who lets into her home all the sunshine and fresh air possible and who uses soap and water freely, is employing the best disinfectants known. Cleanliness will help to prevent disease.

The Care of the Sick

By Mrs. Helen Johnson Keyes, *who, in preparing this article has had, in addition to her own knowledge and experience, the assistance of her husband who is a physician, at present writing in the U. S. Medical Reserve.*—Editor.

Doctors give fewer drugs than they gave years ago and depend more upon good nursing carried on under their directions. Consequently, the work of the home nurse no longer is chiefly made up of administering medicines at certain hours.

Conditions and symptoms. The doctor is grateful when the nurse, be she a trained and paid helper or merely an untrained relative of the patient, can give him in a few words just that account of the invalid which will assist him in understanding her condition and prescribing for it. The important symptoms may differ slightly in different illnesses, but there are certain things that the physician will always want to know, and he will be glad if the nurse has these written on a piece of paper. Temperature, pulse, breathing, amount and kind of nourishment taken, and the digestive processes are what he needs to know about. The nurse, therefore, must understand how to report these.

Temperature. The normal temperature is between 98 and 99 degrees Fahrenheit. From 100 up to 103 degrees is a slight fever, from 103 to 105 degrees a high fever. Fevers in children run higher than in grown people, but fall more rapidly and are less alarming. A temperature below 98 degrees is called subnormal and is occasionally seen in wasting

diseases or after severe bleeding. The temperature is taken by means of what is called a clinical thermometer. Before using the thermometer, the strip of quicksilver which passes through it must be shaken down to below 98 degrees, if it stands above that. Exposure to the temperature of the room will not bring it down. A quick, sharp jar by the hand which holds it is necessary. Then it must be dipped in pure alcohol or a solution of borax (1 teaspoonful to a glass of warm water) to insure cleanliness. It is put either in the mouth under the tongue (and the patient told to hold her lips closed), under the armpit, or in the rectum. In the case of children the latter method should be used to avoid danger of biting and breaking the glass, and also for the sake of accuracy, as a young child can not keep the thermometer steady under the tongue and with lips closed. In this case the end should be greased with vaseline or sweet oil and inserted about an inch. Most thermometers need 2 minutes to record the temperature. Of course, no lengthening of the time they are in position will cause the mercury to rise higher than the temperature of the patient. It is well to read the thermometer at once after removal, but if you are called away before doing so, the mercury will remain at the same place, not falling until it is jarred down. To read, stand facing a light; hold the thermometer on a level with your eyes, the sharp angle toward you and with the figures below visible. Keep shifting, if necessary, till you see the flat band of quicksilver stopping sharply at a certain figure, which figure is the temperature of your patient. Wash the thermometer in soap and water before putting it away. Temperature should be taken several times a day during illness, and recorded on paper, together with the hour when it is done.

The pulse is the throb of the bloodvessels, occurring whenever a beat of the heart fills them. It can be felt best 2 inches below the base of the thumb. Here is a table of pulse beats at different ages, during health: At birth, 130 to 150 per minute; 1 year, 110 to 130; 2 years, 90 to 115; 3 years, 80 to 110; 7 years, 70 to 90; 12 years, 70 to 80; 15 years and after, about 70. They may be irregular without causing anxiety, but if very hard and tight there is probably some trouble. Ordinarily the pulse increases several beats a minute with every degree of fever; but typhoid, on the contrary, makes the pulse slow. The pulse should be "taken," as the expression is, at the same time as the temperature and recorded on paper for the doctor. It is done with a watch in the hand to mark the passing of just 1 minute, while the number of pulse beats during that minute are counted.

Respiration or breathing. Each breath represents our intake of air to the lungs and its escape again. You have probably noticed how rapidly a little baby breathes. It sounds alarming, but, as a matter of fact, this is as it should be. The following normal rates at different ages show the gradual slowing of respiration as we grow older. At birth, 35 per minute; 1 year, 27; 2 years, 25; 6 years, 22; 12 years and after, 20.

Certain diseases increase the number of breaths we draw. In pneumonia, they run up to between 40 and 60. Other conditions make the number less. Poisoning of the system (known as septic conditions or *septicemia*) has this effect. When breaths become as few as 10 to the minute, grave danger is indicated. There is another alarming kind of breathing which is named "Cheyne-Stokes respiration." It consists of deep, sighing breaths, followed by long pauses.

Nourishment. The kind and amount of nourishment taken is a fourth matter to be reported to the doctor, together with the hours it was given and the pleasure or displeasure with which the patient received it.

Digestion and elimination. The activities of the bowels and bladder are of importance, and must be accurately recorded. The tongue should be of a clean, reddish-pink color, and if coated with gray, the doctor should know about it.

Unfavorable symptoms. Certain rashes start on the cheeks inside the mouth. The doctor should be told if any such condition appears. The skin of the face and body should be observed and the doctor informed of any unnatural condition. A bad-smelling breath means that help is needed. Restless sleep must be reported.

Medicines. We have all read of the accidental poisoning of sick people by the nurse in charge. In order to avoid such an accident, make it a rule never to give any medicine without reading the label on the bottle or box. Be careful that the writing on the label does not become blurred. Tinctures need to be placed in a dark cupboard. Keep medicines for rubbing and external use apart from those taken through the mouth. People have been known to fill old medicine bottles with poison, and not remove the former label. This wicked carelessness has caused many deaths. Keep all medicines out of reach of children.

Tight glass stoppers may be loosened by holding them under steam or by allowing a few drops of oil to stand in the crack. All medicines should be shaken before using, and corks should be kept tight. Those which are given by the drop should be measured from a medicine dropper, a tiny glass tube with a rubber bulb which allows but one drop to fall at a time. The following table will help in understanding quantities ordered: 1 teaspoonful equals 1 dram; 1 dessertspoonful equals 2 drams; 1 tablespoonful equals 4 drams; 2 tablespoonfuls equal 1 ounce; 1 teacupful equals 4 fluid ounces: 1 tumblerful equals 8 fluid ounces.

The nurse and her patient. Now let us consider how to make a sick person comfortable. This is the relation of the nurse to her patient, the art of nursing.

Room. When an illness is contagious, a room or rooms must be sought for as far away as possible from the part of the house in which the rest of the family live. The sick rooms must have their own service of linen and dishes, which are disinfected before they are carried out. Carpets, upholsteries and draperies must be removed, and only such furnishings remain as can be washed with disinfectants. The mattress either must be covered by a rubber sheet, or else destroyed at the close of the illness.

When the malady is not contagious, the most cheerful room in the house should be chosen. Sunshine is extremely important. Ventilation must be thorough and may be secured by 2 windows, one open a little at the top for the escape of bad air, and one at the bottom for the entrance of clean air. If the blood is not cleansed by the passage of clean air into the lungs, recovery is slower and less complete. A screen, or a clothes-horse hung with a blanket, is a necessary protection from drafts. The temperature ought to remain during the day at about 66 or 68 degrees Fahrenheit and at 55 degrees through the night. In order to insure its doing so, a reliable thermometer should be in a convenient place for reading. A cheerful outlook will help a patient who is recovering, and although the bed must not face the light, it may be drawn into a position from which the patient can see out. Shades are needed to regulate the light. When these are lacking, the panes can be soaped. Carpets and draperies are objectionable on account of the dust raised in cleaning them. Only floors and surfaces which can be wiped with damp cloths are to be recommended, for the room should be kept absolutely clean. Flying dust is actually dangerous to a patient. Flowers bring much cheer, but they should not have heavy odors, nor be allowed to remain after they commence to fade. At night it is best to set them outside. No worries, no problems should be brought to the sick room. Noise, whispering, and fussing are bad. The nurse must act quietly, quickly and decisively, though gently and kindly. Few neighbors should be admitted, and among them only those who are both cheerful and quiet. Even their visits should be short, and the nurse should ask them courteously to leave after 10 or 15 minutes.

The bed. Nursing is made easier when the bed is raised on blocks to a height suitable to the stature of the nurse. It should stand out from the wall; a single bed is taken care of with less effort than a double one. Newspapers protect the mattress, and can be changed whenever cleanliness demands it. The lower sheet should be tucked firmly under the mattress at the top, even though it scarcely reaches the bottom, and then secured at the four corners with safety pins. Over this the doubled draw-sheet passes across the middle of the bed from side to side and is pinned to the under part of the mattress. This draw-sheet may have rubber under it, if called for. The under sheet will thus remain clean for some time, while the small draw-sheet can be changed with little effort. The remaining bed clothes need firm tucking in at the foot. A piece of dimity or calico will protect the blankets, and be lighter on the patient and easier to wash than the usual counterpane.

In the case of a long illness, when the mattress tends to sag in the middle, a blanket may be folded and laid under the sagging part across the springs. When the weight of the bed clothes annoys the patient, they can be held up by three barrel staves. Pillows should be so arranged as to support the back and shoulders without thrusting the head forward. Bed sores may be guarded against by bathing the back with vinegar. If a sore appears, cover it with white of egg. Then protect it from pressure by making a ring of twisted newspapers wound with cheesecloth. Ordinary chafing is relieved by powdering with pulverized laundry starch or corn starch.

Bathing and the morning toilet. The comfort and wellbeing of the patient require a sponge bath in bed each morning, 2 hours after eating. To do this, place a blanket under the invalid. With water at about 96 degrees, unless otherwise ordered, and with a soaped cloth not wet enough to drip, bathe the patient by sections. That is, keep all the patient's body covered except the part that is being bathed. Slip one arm, for instance, out of the nightgown and expose it just long enough for washing in soap and sponging off in clear water. The use of an extra blanket will make it easier to protect the portions of the body close to the areas being bathed. If not too ill, the patient can turn on her side, allowing her back to be reached, and can put her knees up and her feet in a basin or tub of water placed on the bed.

In changing nightgowns, the soiled one can have the running string in the neck loosened so that it will slip off at the feet while the clean one is put on over the patient's head, thus avoiding exposure. Unless a clean nightgown can be supplied each day, it is a good plan to have 2 in use; each can be worn one day and aired the next.

Care of teeth and hair. The teeth should be brushed at this time and the mouth rinsed with a teaspoonful of peroxide of hydrogen or

4 drops of pure alcohol in half a glassful of water. If the patient is a woman, her hair needs a gentle brushing and combing and is best taken care of in two braids.

Making the bed. When only the upper sheet is changed, the covers are loosened from the bottom and sides, the clean upper sheet is inserted over the old one, tucked in at the foot, and held firmly with one hand while the soiled sheet is pulled out. When the under sheet and draw-sheet require changing, move the patient to one side of the bed, loosen all the covers, and from the unoccupied side roll the soiled undersheet and draw-sheet along widthwise against the patient. Insert the clean sheets over the free space and bring the patient back to that side of the bed upon them. The old sheet is then free, and can be removed, and the new ones drawn across smooth and tight, tucked in, and pinned. In the case of a helpless invalid the bed clothes are worked from up at the head and down at the foot of the bed by two people and the patient is gently raised while the clothes are passed under the hips. To lift, two people should stand on the same side of the bed. One supports the shoulders and brings her arm under the further arm of the patient; the other places one arm under the hips, the other under the knees.

How diseases spread. Most illnesses, except those due to accident, to the advance of old age, or to poor nutrition (poor food or poor handling of food by the body), are produced by germs and may be passed on to family and neighbors. The ease with which the germs are carried—called contagiousness—varies in different diseases. Germs also get into the system in different ways. The typhoid germ, for instance, comes through something that we eat or drink. Most germs can be breathed in, and some enter through scratches, cuts, and open wounds. When there is a disease in your neighborhood, it is a good plan to find out how it is "caught," how soon after exposure to it the sickness develops (this time between exposure and active sickness is called in medical books, the "period of incubation"), and what the first symptoms of the disease are. This is very important in the contagious diseases of childhood.

Many drugs are dangerous. Never give medicines to your family or yourself just because doctors have prescribed them to your neighbors. Your constitution may not be at all the same as your friend's. Beyond all, remember that drugs act upon children very differently from grown-ups, and that certain ones never must be given them, even in small doses. Only the doctor should prescribe medicines. As for patent remedies, many of them are fakes, amounting to little more than flavored water, and many are yet worse, full of harmful, habit-forming drugs, such as morphine and alcohol. These may quiet the symptoms of the disease for a time, but do not cure it. A few are reliable and useful preparations under the right conditions, but a doctor is usually needed to decide whether you are suffering from the troubles which they will help.

What to do while waiting for the doctor. When no doctor can be had, or when a long delay must occur before his arrival, there are many things which a sensible nurse can do.

In the case of *chills, exhaustion, pain in the joints, inflammations, electric shock, lightning stroke, and colds and grippe where there is not a fever*, hot-water bottles, heated bricks or hot bags of salt should be used to warm the patient, who, of course, must be put to bed. Hot milk may be given. In the case of chills, the heat must be gradually removed as the hot period approaches, and when the sufferer begins to perspire, the skin should be wiped dry gently from time to time, and powdered with rice-powder, starch, or corn starch.

Unconsciousness which is brought about by a blow on the head, requires cold applications—ice, if possible—at the head, and hot ones at the lower extremities.

Headaches and sleeplessness are often relieved by mustard foot baths, lasting 20 minutes. A tablespoonful of mustard is required for a gallon of warm water. The tub must be supplied with more and more hot water as the supply cools, and the legs kept snugly covered with a blanket.

Epilepsy can not be controlled. A soft cloth should be placed between the teeth, to prevent biting the tongue, and a pillow should be placed under the head.

Convulsions of babies are best treated by

mustard baths, made by mixing 4 or 5 tablespoonfuls of dry mustard in a gallon of warm water. The child should remain in it until the skin is red. After complete recovery from the attack, a high injection of warm, soapy water into the upper bowel is called for. This is done by adding rubber tubing to the usual fountain syringe and putting it up from 6 to 12 inches into the bowel.

Most of the sudden illnesses of little children are caused by *indigestion*. A warm water injection will often bring down a high temperature at once. Food should not be given at all for several hours, and then only liquid food in small quantities, until complete recovery.

Bleeding from a wound can usually be controlled by pressure over the wound, or by a very tight bandage above or below it. When the blood from a wound comes in spurts and is rather bright red, it is probably from an artery. If so, the bandage should be placed between the wound and the heart. Where the flow of blood is slower, regular and the color somewhat darker, the indications are that it is from a vein. In this case the bandage should be placed beyond the wound—if on an extremity, such as arm, leg, hand or foot—instead of between the wound and the heart.

Nose bleed is sometimes checked by pressure on the upper lip at the base of the nostrils. A cloth which has been dipped in cold water may also be applied at the back of the neck. Another treatment is to hold the head erect and place a clean cotton plug or one soaked in peroxide of hydrogen, in the nostril.

Hiccoughs are stopped by a few drops of vinegar on sugar.

Burns and freezing. In case your clothing catches fire, do not run out into the open. If the fire cannot be put out in any other way, lie down and roll over and over on the floor. In attempting to put out a fire in the clothing of another person, smother the blaze by throwing round him a blanket, coat, or anything woolen that may be near at hand. In any burn the first thing to remember is to exclude the air. Do not open the blisters. In case of severe burns call a physician. The burn may be covered with a poultice of common baking soda or with a cloth coated with linseed oil.

In severe winter weather, we may freeze our ears, nose, toes, or cheeks. The frozen part first feels cold, then turns red and later feels as if going to sleep. At the same time the color changes to a dark red, and later all color leaves and the frozen part becomes white. Under these circumstances keep away from the fire or a warm room. Put the frozen part in a bucket of ice water or rub briskly with wet snow. As soon as feeling returns wrap in cloths that have been wrung out in ice water.

Fainting and sunstroke. The first thing to do when a person falls in a faint is to place his head lower than his body. Open his clothing about his neck and chest, and sponge his head and face with cool water. Do not allow people to crowd about him as this cuts off the air.

Heat exhaustion and sunstroke usually occur in extremely hot weather. In the case of heat exhaustion, the skin is cool to the touch and is damp; the face is pale, and the breathing is shallow. In heatstroke the skin is very hot and dry, the face is very red, and breathing is deep. Also in heatstroke the victim is usually unconscious. In treating for heatstroke, place the patient in the coolest place possible. Pour cold water over the body, and if ice is to be had, use it in rubbing the body all over. As soon as the victim becomes conscious, give him cold water, but not ice water, in small quantities. In case of heat exhaustion, place the victim in the shade, open his clothing round his neck, and lower his head, give him black coffee or other stimulants. Then wrap him in blankets and rub his limbs until they feel warm.

First aid in drowning. After getting the person out of the water, the first thing is to get the water out of his lungs. In doing this open his clothing about his neck, turn him on his face, then stand astride him and pick him up by placing your hands along his body just above his hips, and lift him so that his face falls towards his toes. Hold him in this position and shake him up and down several times. Bear in mind that the first object is to get the water out of his lungs so air can get in. It is well to wipe out his mouth as it may have been filled with mud or sand or phlegm.

The next thing is to start him breathing. In this lay him face down, turn his head to one side so that the nose and mouth are not in the dirt. Bring his arms straight up above his head, get astraddle of his legs up close to his hips and place your hands under the lower edge of the lowest rib, turn your hands outward so your fingers point away from his backbone. Then put the heels of your hands on his back 2 or 3 inches from his backbone, having one hand on each side of the backbone, and the little finger of each hand along the lower edge of the lowest rib on each side. Then keep your arms straight and throw your weight forward on your hands and stay in the position for about 3 seconds. Suddenly remove your weight, then wait 2 or 3 seconds and again put on the weight. Keep up this movement 12 or 15 times a minute until breathing has been started. After this as soon as the victim is conscious, give him something hot to drink and wrap him in blankets so as to keep him warm. Watch him carefully to see that he does not stop breathing.

Sprains and fractures. In case of a sprained ankle or wrist, put hand or foot in a bucket of cold water at once. Keep adding cold

water, or ice water is better if it can be had. Keep the limb in water for about a half hour, bandage tightly, and as soon as possible consult a physician.

In case of a broken bone, see that the injured limb is not moved more than is absolutely necessary; try to keep the limb in a natural position and hold it there by use of splints.

For splints, use pieces of boards, sticks or anything strong enough to hold the limb so it cannot move. The main thing is to put the splints on tight enough so that there can be no movement of the broken ends of the bone, yet not so tight that they will cause pain or pressure. In placing the splints, pieces of cloth or anything soft may be used for padding. Consult a doctor as soon as possible.

Poisoning. In treating for poison, the aim is either to get the poison out of the system or give something that will change it so it will no longer act injuriously. To get the poison out of the system, the first thing to do is to empty stomach by causing vomiting. To do this, give a glass of warm water with a teaspoonful of salt in it, or a glass of warm water with a teaspoonful of mustard in it. Then put your finger down the victim's throat as far as you can, or tickle the back part of his throat with a feather until he vomits. Give water from time to time so as to keep him vomiting until the water he throws up is clear. There are times, however, when we should not give him something to make him throw up. If there are burns on the lips or in the mouth, this indicates that carbolic acid or some other strong acid has been taken. The proper treatment then is to give hot strong tea, milk or white of egg.

Every poison has its antidote—by which is meant its remedy. The following list shows some of the common ones:

For *poisoning from opium, laudanum and morphine.* An emetic should be followed by strong coffee, or the white of an egg. Keep the patient walking for two or three hours.

For *poisoning from arsenic, corrosive sublimate, verdigris, blue vitriol, and vegetables kept in copper vessels.* Give an emetic and the white of an egg, sweet oil and milk.

For *sugar of lead poisoning.* Give an emetic and Epsom salts.

For *poisoning from hemlock, aconite, belladonna and foxglove.* After emetic give tannin and stimulants.

For *strychnine.* First give an emetic, and then a large dose of bromide of sodium (60 grains in solution). Repeat every hour until three or four doses have been taken.

For *toadstool poisoning.* Give emetics promptly, then castor oil and stimulants. Apply heat.

For *poison ivy or oak.* There are three generally effective remedies for poison ivy or mercury. One is to apply hot water to the poisoned surface. Another is peroxide of hydrogen. The third is a solution of sugar of lead, about 40 grains to a pound of water. Two other remedies that are more or less effective are baking soda and dry starch.

Warm salt and water to produce vomiting is desirable. If the mouth and throat are burned, tepid milk and white of egg are soothing. Poisoning by gases is treated with fresh air, and by artificial respiration if the condition is so serious as to amount to unconsciousness.

When a person has been bitten by a poisonous snake, place a tourniquet without the pad between the wound and the heart. Then with a clean knife blade make the wound from the bite larger so that blood will flow from it. An ordinary knife blade may be made safe by first holding it in a match flame. After opening the wound, have the injured man or some one else suck the wound, then follow with stimulants.

Miscellaneous Measures. *Fevers* may be reduced by sponge baths at 15-minute or half-hour intervals with water at a temperature between 70 and 85 degrees.

Stimulation will result from bathing in water between 98 and 110 degrees. One fourth of a pound of rock salt added per gallon will increase the invigorating effect.

Bran baths often relieve eczema and other irritations of the skin. Half a pint of wheat bran is put in a bag made of cheesecloth or coarse muslin and stirred about and squeezed in one gallon of water at about 95 degrees, till the water is like thin porridge.

Poultices are very little used in these days, having been generally replaced by wet dressings, called *fomentations*, for the relief of inflammations.

These are prepared by soaking a white flannel cloth in boiling water (which may sometimes be medicated, but often is not) and laying this steaming flannel quickly in a towel, where it can be wrung almost dry without burning the fingers. It is then taken from the towel and applied to the inflammation from which the patient is suffering, and covered with another flannel and, if possible, also with a rubber cloth or oil silk, to retain the heat.

A *mustard fomentation*, used for the same conditions for which a mustard plaster was formerly prescribed, is made by adding 1 tablespoonful of dry mustard to a pint of hot, but *not boiling* water.

A *flaxseed fomentation* is made by stirring into boiling water enough flaxseed to thicken it till it drops from a spoon.

When, after an accident, a deformity appears between joints, it usually means there is *dislocation.* Gently pull the member straight and put it between 2 boards wider than it is. Bind the boards together and send for the doctor.

Artificial respiration should be used (as soon as heat and dry garments are secured) in cases

of electric shock (which includes lightning stroke) and drowning. For this treatment the patient is placed on his back and his tongue pulled forward and held there with a clean cloth. His arms are then grasped by the shoulders, brought together over the head, circled downward to the chest, against which they are pressed to force out the air. This should be done *slowly*, about 20 times to the minute, till life is fully restored.

Diet, or food for the sick. Diet is a matter of the utmost importance. Nourishment should be given with absolute regularity, at short intervals and in small quantities. It should be brought to the bedside on a dainty tray in attractive dishes. What is left should be removed immediately.

It must be remembered that there are certain disturbances of the stomach and intestines during the most serious stages of many diseases when no food should be given. When the digestive tract is in such a condition that it cannot take care of what is put into it, but at once gets rid of it by vomiting, food does no good but may do harm. Under such conditions, there is no remedy like doing without all food. Do not be afraid, in these extreme cases, to continue starvation for as much as 48 hours. This is specially true with babies and young children, who are frequently fed to death in illness.

There are 3 kinds of diet ordered for sick people: liquid, soft or light, and solid. The following lists will show what is meant by each of them and supply suggestions for pleasing and nourishing the invalids who come into our care:

Liquid diet, as a rule, is given at 2-hour intervals. It is the diet ordered for the very sick, and milk is its most valuable article. From half to three quarters of a cup is the usual amount taken at a feeding in the case of all these drinks, which include hot and warm milk, hot cocoa, beef juice, chicken broth, beef broth, oyster broth with milk, egg-nog, hot tea and hot coffee, with milk and a little sugar.

Light diet includes the foods given in liquid diet, and adds to them: soft-boiled, poached, and scrambled eggs; granum or farina porridge; farina mush; cream of vegetable soups; milk, cream or dry toast; custards; grapes and oranges; homemade ice cream; jellies; and *very light* puddings. Usually five light lunches a day are given, with not more than two articles at a meal.

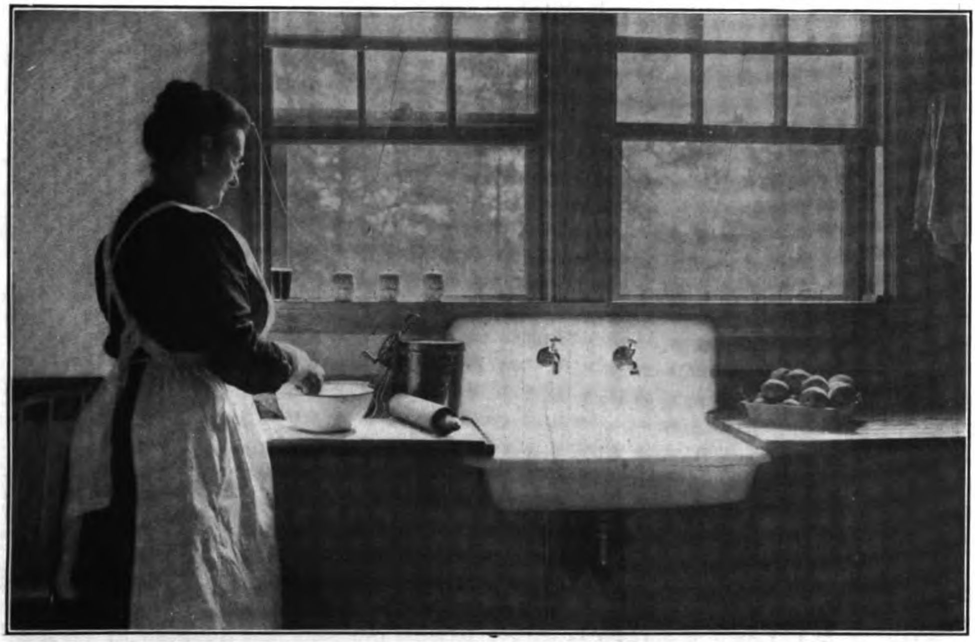
Solid or convalescent's diet. This makes use of the articles given under liquid and light diet, and adds: broiled and roasted meats, *except veal and pork;* fish; baked, creamed and mashed potatoes; well-made bread; and light cake.

Pastry, fried food, gravies, salad dressing, and all rich articles must be avoided. It is best in most cases to serve five light meals, consisting of small amounts of three or four articles.

When the sick person is getting better. The period of recovery is a trying one. Exertion is followed by exhaustion and discouragement. The farm woman is usually obliged to get up too soon. Every effort should be made to keep her quiet as long as possible. In cases of childbirth, even after a normal confinement, she should be in bed at least 10 days, while another week should be given over to "finding her feet" before any work other than the care of the baby is taken up. The loss of time just then will be more than made up by reason of the better health with which she will work when she begins.

Destroying the disease germs. During contagious diseases, the nurse, the patient's room, and everything which comes near the patient should be disinfected constantly. At the end of the illness, the room must be fumigated, and the patient herself, as well as any clothes which have been exposed to the contagion, must be disinfected. There is no good accomplished by hanging around the sick room cloths soaked with disinfectants. Germs must be caught and drowned, as it were, in the solutions; they cannot be killed at long distance.

Chloride of lime. The discharge of patients, in illnesses where those discharges carry contagion, should be disinfected before they are buried. For this purpose a solution of from one to two quarts of chloride of lime must be poured into the vessels where they are deposited. To make this solution, buy the best quality of chloride of lime, and dis-



The farm woman works in her kitchen three hundred and sixty five days in the year. It should be convenient, therefore, and have a pleasant outlook for the mind to enjoy while the hands are at work

This sort of family coöperation is not so unusual. But how often do we find the farmer helping with the dishes or the house cleaning?

WOMAN'S SPHERE MAY BE THE HOME, THE NURSERY AND THE KITCHEN, BUT MANY A FARM SUCCESS HAS COME THROUGH HER AID AND INFLUENCE OUTSIDE THEIR LIMITS

The best farmer is he who raises a structure of scientific "book knowledge," upon a foundation of practical farm experience

A characteristic of successful farmers is an inquiring mind, a desire to know why things are as they are

THE WAY TO TEACH FARMING IS TO MAKE IT INTERESTING. THIS MEANS THAT THE "WHY" MUST BE EXPLAINED AS WELL AS THE "HOW"

solve it in the proportion of 6 ounces to a gallon of water. This is a poison and must be labeled accordingly and kept in a safe place, apart from medicines and foods, and out of the reach of children.

Carbolic acid. A disinfectant for wiping walls, floors, furniture, dustpans and other cleaning utensils is made by adding a 5 per cent solution of carbolic acid to a gallon of water. This, too, is a deadly poison.

Chlorinated soda. To wash the nurse's hands and body, and the patient's when recovery takes place, use 1 part of a solution of chlorinated soda to 9 parts of water. This is sold under the name of Labarraque's Solution. Mark it "Poison."

Disinfecting washable articles. To disinfect washable articles, prepare enough water to cover them. To this water add 40 per cent formaldehyde solution, in the proportion of 2 tablespoonfuls to each gallon. Stir it well into the water, and allow the clothes to soak for at least half an hour. Then wash them as usual.

Fumigating a Room After Sickness

This may be done either with formaldehyde or sulphur. The room must be thoroughly sealed by stuffing keyholes and cracks, or pasting over them strips of sealing paper made for the purpose, which may be bought from a drug store or mail-order house. One door must, of course, be left free to open for the exit of the person attending to the work. Open drawers, cupboards, and closets, hang unwashable articles on lines strung across the room, spread out the pages of books. Then set a dish of water boiling on the stove in the room in order to fill the room with steam. Unless the air is damp, fumigation will do no good.

First, find out the size of your room in cubic feet in order to know how much disinfectant to use. Do this by measuring it, and multiplying length, breadth and height together. This gives its contents in cubic feet. Then, divide the result by 1,000 which will tell you the number of thousand cubic feet. This is called "unit space" in rules for disinfecting.

Sulphur. If you are going to use sulphur, you will need 3 pounds of it for every 1,000 cubic feet. Place a tub in the middle of the room. Put in it 2 inches of water. Set two bricks in the bottom and on them an iron or tin pan, or a stone crock with the sulphur in it. Pour over this a spoonful of alcohol or coal oil and light it. Then leave the room and allow the sulphur to burn up. Leave it closed for about three hours. Sulphur candles may be used in just the same manner, but they are more expensive if a sufficient number of them is used to get the result.

Formaldehyde. In using formaldehyde, 2 pints of it and 13 ounces of commercial permanganate of potassium are necessary for every 1,000 cubic feet. First put the permanganate of potassium in a large wash bowl or galvanized tub in the middle of the room. Then pour in the formaldehyde and leave the room. No burning is needed in this process. It has also the advantage of not tarnishing or changing the color of fabrics.

The Medicine Closet

The farmhouse medicine closet does not need to be very large. What is not in it is almost as important as what is. It is of great importance not to keep old medicines which have become stale and therefore lost their value, and not to stock it up with patent medicines.

Some of the remedies necessary to the treatment of illnesses may be taken at any time from the kitchen store room. For instance, we have mustard, white of egg, vinegar, borax, starch, corn starch and rock salt, which have already been mentioned. Bottles and bricks for heating can also be drafted from the kitchen.

The medicine closet should contain, however, a fountain syringe, with some additional rubber tubing, or a rubber catheter, for high injections; a clinical thermometer; 2 medicine droppers; a white flannel cloth for fomentations; some rubber sheeting and oil silk; flaxseed; bran; a pound of cotton waste, or the more expensive absorbent cotton; two packages of surgical gauze; a bundle of soft old cloths which have been thoroughly washed, then sewed up in a clean cloth and baked in the oven. A bottle of hydrogen peroxide and half a pint of pure alcohol will often be useful, but if it is not convenient to have them, strong salt and water, borax and water, and vinegar may be used in their place for cleansing wounds or washing the hands and body after exposure to contagion. Castor oil, calomel, and rhubarb and soda may well have places on the shelves. There should also be antidotes for a few of the common poisons. Special illnesses must, of course, bring special needs, but such a medicine chest will find you prepared to meet most of the accidents and illnesses which occur.

FIG. 208. These boys really own these pigs; and in raising, feeding, caring for, and marketing them, they are going to learn many things that will help to keep them on the farm and interested in it. How many farmers give their sons as good a reason and incentive?

CHAPTER 13

The Child on the Farm

THE child is father to the man" and "the boys and girls of to-day are the men and women of to-morrow" are sayings familiar to all of us. Yet how often do we do all that we might, and should, to enable children to assume successfully the responsibilities they are destined to bear? It is a source of pride for a father when his son follows in his footsteps, takes up his business, and carries on, efficiently and honorably, the activities that have been his life-work. Yet how many farmers make any special effort to arouse real interest in and love for farm work, in the minds and hearts of their sons? How many farmers' wives help their daughters to see farm life as something to look forward to and strive for, instead of an endless cycle of drudgery and privation?

Some do, of course; to them are we indebted for many of the nation's best farms and finest farmers. But on many farms there has yet to be born a complete realization that the child is deserving of careful thought and study as well as of affection, discipline and education; that its importance and value as a farm asset—putting aside any other consideration—are far above those of any crop or flock or herd; that as a comrade and a partner, legally and morally, in the farm's affairs, it has rights and privileges that should not be denied it.

The farm can mean much to the child; the child can mean much to the farm—both the individual farm and the farm that represents the agriculture of the nation. It is the aim of this chapter to tell and show what this relationship can be made, and how to bring about its greatest and most permanent fulfillment.—EDITOR.

TEACHING CHILDREN TO BE HEALTHY AND GOOD

By MRS. HELEN JOHNSON KEYES, *who writes with the knowledge that comes from having provided for, as well as borne and cared for, her children. Moreover, she has observed conditions in many families both on and off the farm; she has noted the instances of wealth and of poverty in true understanding and sympathy between parents and their children; and she has sought and formulated many of the principles upon which can be built strong young minds in strong young bodies, and unbreakable ties of family love and comradeship as well. The training and care a child receives during infancy form the root, stem and branches of its development in after life.*—EDITOR.

CHILDREN are much alike, whether born in the city or in the country. The boy born in the country may not become a farmer; and the girl whose first home is in the city may later choose the country as a place to live in. So there are certain principles which apply to the bringing up of all children, regardless of birthplace. Furthermore, it is not right that we should think of country children as making up a distinct group: they do not. So what we have to say here, while intended first of all for the children of the farm, applies, in the main, to all children, whether of city or of country.

The process of teaching our children to keep themselves healthy, and to control their desires and tempers should begin at birth and continue until these boys and girls become men and women. More and more we are recognizing the connection between the physical habits established in childhood and the moral habits which control later life. Children need to be made to understand that he who breaks Nature's laws must pay the penalty. Some one has said, "God doesn't always pay on Saturday night, but he always pays."

The Baby

Why not begin right? That is, when mothers really have control over their offspring. It is our best chance. Let us commence on the foundation.

Care at birth. After the umbilical cord has been tied, the newborn baby should be warmly wrapped, and then each of his eyes should receive a drop of a 10-per-cent solution of argyrol or a 2-per-cent solution of nitrate of silver. The importance of this treatment needs to be strongly emphasized; for it frequently prevents lifelong blindness, to the danger of which many children are exposed at birth. Later, after the mother has been made comfortable, the baby must be washed clean with sweet oil or vaseline and then sponged off with water and soapsuds at a temperature of 100 degrees. The temperature in the room should register about 72 degrees and, although there must be no drafts, the air ought to be fresh and pure. After dressing, the baby must be made warm in his basket and put in a darkened room which is well ventilated, but without drafts. It is best not to allow a baby to occupy the bed with his mother or with any one else.

FIG. 209. Every child should be taught the value and necessity of cleanliness as soon as old enough to learn anything.

Bathing. Until about the fifth day, when the stump of the cord drops off, only sponge baths are possible. After this, the normal child should go into a tub every day, in water registering about 98 degrees Fahrenheit. This temperature may be gradually reduced to 90 at 6 months and to 85 at 1 year, if, after each bath, the baby reacts properly. There is no safer soap than Castile; and 3 times a week the bath should include a very gentle washing of the scalp in soapsuds.

Feeding the baby. Food is taken primarily for nourishment, and must be made use of in a manner to promote that purpose. The newborn baby should receive little more than half an ounce of milk at a feeding, or

FIG. 209a. But until then, it is the mother's duty to insure the health and cleanliness of ears, nose, eyes and all the body.

10 minutes at one breast. The work of digestion should be accompanied by complete rest. Doctors vary in the length of the rest interval which they recommend, but let us take for granted that it is to be 3 hours between the beginning of one nursing and the beginning of the next. Then we shall have for a convenient daily feeding-schedule, from the third day to the fourth month, the following: 6 A.M., 9 A.M., 12 M., 3 P.M., 6 P.M., 9 P.M., 2 A.M.

After a baby is 4 months old, the 2-o'clock morning feeding may be omitted, and both baby and mother will profit from the unbroken night for sleeping. A child should be awakened for his food. In a little while, he will rouse himself regularly at the end of the appointed time. When the nursing is over, he should be laid very quietly on his back or his right side and encouraged to sleep till the next period. If he is clean, dry, and warm (but not too warm), he will quickly learn to do this; and, if it is evident that he is comfortable, no attention need be paid to his crying while he is learning this lesson.

During the first 24 hours after birth a baby should have no food. Boiled water cooled to body temperature may be given him several times, either from a spoon or from a thoroughly clean nursing bottle with a thoroughly clean nipple. The second day he should be put to the breast every 4 hours and once in the night. The third day the regular interval should be established and followed by the clock. The length of time allowed for a nursing may be gradually extended during the first month from 10 to 20 minutes; at no age is more than 20 minutes advisable. In the case of a bottle-fed baby, an easily remembered general rule is that he may receive one more ounce at a feeding than the number of months he is old. Fifteen or 20 minutes should be allowed him to take this amount, which can be arranged for by regulating the size of the 2 little holes in the nipple, and by removing the bottle for a moment, if the contents are disappearing too rapidly. See that the bottle is held in such a way that the neck is always filled with milk; otherwise, the baby will suck in a certain amount of air, which is likely to produce colic.

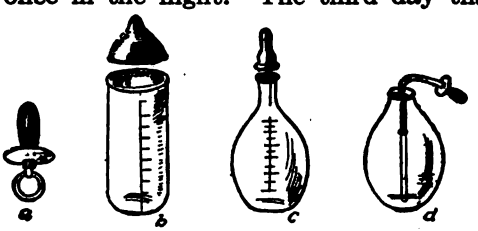


FIG. 210. Some things to avoid: *a*, the pacifier, which is often unclean, and usually productive of poor health and bad habits; *c* and *d* are both unsanitary nursing bottles, *d* being much the worse; *b* is the right type to use.

Weaning. Every healthy mother should make a great effort to nurse her baby, because no other food is exactly what the infant's stomach requires. No food has been found which produces the body-building materials in the same proportions, and the breast-fed child has far greater power than the bottle-fed to fight off illness. There are, however, certain diseases which may render a mother's milk entirely unfit; and in the case of a second pregnancy, weaning should take place at once.

No child should be nursed more than one year, and in most cases, it is necessary to introduce artificial feeding at about the ninth month. A doctor should be consulted for the correct mixing or weakening—called modification—of cow's milk. The weaning, unless the necessity for it is hastened by the mother's illness, should be made gradually, beginning with one bottle of cow's milk a day. Cool weather is better than warm for the change, but the important thing is to be sure that the milk is kept cold and fresh.

Making the milk safe for baby. If you are not absolutely sure of the health of the cows and of the sanitary manner in which they are kept and milked, pasteurize the milk for baby each day. That is, heat the milk so as to kill dangerous germs, but without raising the temperature to the boiling point. The best way to do this is to mix or weaken the milk as the doctor has directed for the number of feedings which baby has in the 24 hours.

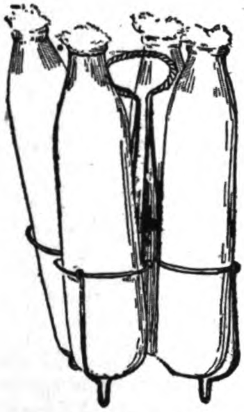
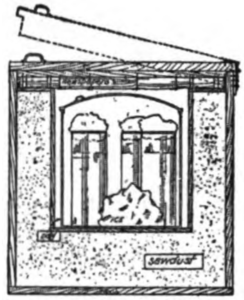


Fig. 211. Nursing bottles prepared, stoppered with cotton plugs, and in a holder ready for the sterilizer or the ice box.

Pour this supply into as many bottles as there are feedings. Cork the bottles with absorbent cotton, and stand them in a rack, which may be made by topping a kettle with lacings of wire so spaced as to support the bottles. Then stand this bottle-filled rack on a pie plate turned upside down and having holes punched in the bottom, first having placed the plate in a pan of water. Place the kettle on the fire and a thermometer in the water, and when the latter registers 155 degrees Fahrenheit, take the kettle from the fire, cover it and the bottles with a blanket, and let them stand so for 45 minutes. Then remove the bottles, immerse them in lukewarm water, then in colder and colder water as the glass will bear it, and finally set them in the coldest place you have, best of all on ice. Rapid cooling is a necessary part of pasteurization. There are pasteurizers on the market which for ease and accuracy of work are to be preferred to any homemade device.

When the milk is fed to the baby, its warmth must be such that a drop falling on the back of the hand feels just tepid. This is done by placing the filled bottle in a dish of water on the stove for a few minutes. Let the child take what he desires in 15 or 20 minutes, and throw away what he leaves. Milk which is kept after warming, develops a dangerous number of microörganisms, or germs, and is poison to the stomach. No matter how little the baby has taken, let him go without more till the next regular feeding time. This is very important. Boiled water, cooled to tepid, should be given occasionally each day, between meals.

Care of the bottles. When all the bottles are empty, rinse them in soapsuds and then in clear water, and boil them for 10 minutes. Add a teaspoonful of borax or of boracic acid to the water, and allow them to remain in it until you are ready to fill them for the new day. The nipples, of which there should be as many as there are bottles and feedings, must be rinsed inside and out and boiled for 10 minutes, too. They may then be kept dry in a covered dish. In putting a nipple on a bottle, do not touch the part which the baby sucks, but stretch the lower part of the nipple over the neck of the bottle.



U. S. PUBLIC HEALTH SERVICE

Fig. 212. Homemade ice box on the fireless cooker principle, in which a day's supply of prepared nursing bottles can be kept. (U. S. Public Health Service.)

Feeding after infancy. At 1 year a normal child is ready for whole milk taken from a cup. To it may be added starch-bearing foods thoroughly cooked and strained until about like a thin jelly, 2 ounces of one of these to 8 of milk. There should be 5 feedings a day. At the midday meal, beef juice may precede the milk, beginning with 1 teaspoonful and increasing to 2 ounces. This is made by chopping finely 1 pound of lean, uncooked steak, and standing it in 8 ounces of water in a covered dish from 6 to 8 hours in a cool place. The meat is then put in a piece of coarse muslin and twisted till the juice flows. This will yield about 3 ounces. Salt or celery salt may be added, but no other seasoning. Meat presses, also, are used for making beef juice, in which case the steak is slightly broiled and then put in the press. The juice should always be given at a temperature under 100 degrees, else it will be indigestible. If the baby dislikes the taste, the juice may be added to the milk, when the flavor will hardly be detected. Twice a week a soft-boiled egg, with dried bread crumbs or unsweetened cracker crumbs, may be substituted. Orange or prune juice, a tablespoonful once a day, should be begun at 4 months and continued.

At 18 months, unstrained cereals, thoroughly cooked, may be given with milk or cream, but are best without sugar. At midday, 1 teaspoonful of raw, scraped beef is good. This may be alternated with chicken or mutton broth from which all grease has been removed. Good bread with a little butter may be added to each meal; and, instead of juices, a tablespoonful of the pulp of stewed apples, peaches, or prunes may be used once a day. Three meals a day, with a glass of milk between each, are enough.

Milk should be the basis of the diet at least until the seventh year. A child should drink

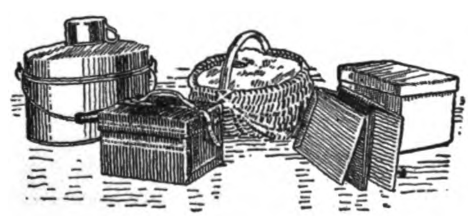


Fig. 213. Desirable types of lunch boxes for the child to take to school or on trips away from home

FIG. 214. Frequent, regular weighing is a good way to keep track of the baby's progress and growth.

a quart a day. Baked or mashed potatoes and soft-boiled, poached, or scrambled eggs, as well as certain green vegetables, especially peas and stringed beans, may be given frequently after the second year. Chicken, beef, or lamb, when broiled or roasted, may be cut very fine—minced—and a tablespoonful given 3 times a week in the middle of the day after the second year. The amount may, of course, be increased, and the cuttings become less fine as the child grows up. The evening meal should not consist of anything heavier than toast and cereal. Loaded stomachs mean restless sleep.

The following articles should be prohibited until the seventh year at least:

Corned beef, dried beef, veal, pork, ham, game, kidney, liver, sausage, and stuffing; fried foods of all kinds; cucumbers, onions, celery, radishes, beets, eggplant, corn, pineapple, and salads; cheese, rich cake, pastry, preserves, jams, and candies; tea and coffee and all alcoholic drinks.

Weight and development of the baby. Correct scales are important, because they tell whether or not the baby is receiving the right nourishment. A weekly weighing should take place for the first year. There is a loss of about 10 ounces during the first 3 days of life, the birth weight being regained about the tenth day in the case of breast-fed babies, but not for 3 or 4 weeks in the case of those who are bottle-fed. After this, 6 ounces a

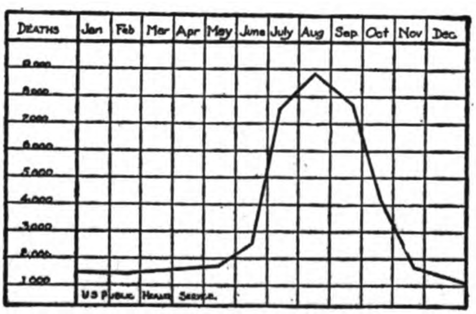


FIG. 215. Chart showing number of registered deaths in the United States in 1912 from intestinal diseases among children under two years of age. The total is 42,482 of which 24,298 occurred in July, August and September! No wonder the second summer is "dreaded"; yet the fault lies mostly with the parents who fail to give their children the right care.

week is the least gain which a healthy child should make during the first 6 months. After an illness, very light feeding may be necessary, and weight is not to be considered, but only the recovery of the digestive apparatus. During the second 6 months, a gain of 4 ounces a week is satisfactory. At the end of the year, a child should weigh about 3 times as much as at birth.

Average babies weigh from 6 to 9 pounds at birth, and are about 21 inches long. They can see only patches of light and darkness. Not until the end of the third month do their eye muscles act harmoniously, so that the crossing of eyes before this age need not cause anxiety. Eyesight remains somewhat defective up to the eighth year, which fact we should remember when we begin to educate our children. The new-born baby is deaf for 24 hours, after which his hearing becomes very acute, and he should be protected against loud noises. The teeth are present in the gums at birth; and they grow steadily until, between the fourth and ninth months, the 2 lower incisors usually appear. The process of cutting the first set of teeth, 20 in number, is complete at about 2½ years of age. There should be no illness connected with this process. Never neglect any indisposition which occurs at this time, saying, "It is only a tooth." Many, many children die from neglect, because what is really a symptom requiring medical care is put aside as due to the teeth. Babies should be just as well during teething as they are at any other time; and they will be, if they are properly fed, and their ailments receive prompt attention.

A healthy second summer. The dreaded "second summer" has become a season of illness only because at that time we often begin to overfeed children and to give them starches and other foods suited to grown people, but not suited to little stomachs.

Clothing. During the first month, a baby wears around his abdomen a flannel binder secured with small safety pins. These pins should not be directly over the spine nor over the navel. Half a yard of 27-inch flannel will make the 3 binders which are necessary. At the age of about a month, the binder is exchanged for a knitted band with shoulder straps, worn, like the binder, under a long-sleeved shirt. A mixture of cotton and wool is best for these two garments, for the flannel petticoat, and for stockings. Stockings are unnecessary for the infant in long clothes, for usually they are either wet or are kicked off and dangling from a pin. The feet can be kept warm by blankets.

Learning to sit up. Season and climate permitting, long dresses may be changed to short ones at about 6 months of age, when the legs need freedom for exercise. Little flannel jackets become useful at this time; for, when the baby is about 8 months old, he learns to raise

himself into a sitting position, and remains there. Until then, he should be encouraged to lie as flat as he will, without even a pillow under him, and firm support should be given to his spine and head when he is carried. Serious curvatures often result from the neglect of this support and from the effort to hasten the sitting-up period.

Standing and walking. Between the third and fourth months, a baby begins to use his hands intelligently, learning to grasp the objects of his desires. From the ninth to the fourteenth month, he is busy learning the use of his feet. At 14 months, he is usually able to walk alone. All contrivances to hurry this accomplishment, such as baby tenders or baby jumpers, are to be avoided. A child should stand and walk exactly when he is able to, without being either urged on or held back.

Talking. At the beginning of the second year, a child utters a few words, and invents a name for his mother. By the end of the year, he is forming sentences, still somewhat incomplete, but making sense. After this, improvement is rapid.

Fresh air. Nothing has been said about fresh air, which is a matter only second in importance to good nourishment. The age at which a baby may go out of doors depends, of course, on climate and season. In a temperate climate, during fall or spring, this may safely occur in the second or third week. Soon afterward, the habit of sleeping out of doors all day during fine weather should be established. The carriage is the best bed for this purpose if it has a hood. The greatest care should be taken to protect the baby's eyes from the sun; and the hood should be reversible, so that it can be shifted quickly for this purpose, as the light changes. Every device for keeping the baby and the child out of the house and in the fresh air in good weather should be used.

When the Child is no Longer a Baby

School life. At 6 years of age, many a child enters school. The writer believes this to be 2 years too soon. His eyes are not ready for close work; his body rebels against restraint; and his mind is incapable of absorbing the work given him. He is likely to form habits of dawdling and idleness in the schoolroom, because there is little that he can do. Happily, though, modern methods of teaching, combining work and play, are bringing about great improvements.

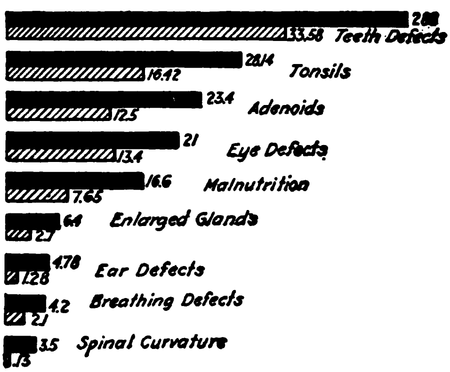


FIG. 216. Comparative per cents of physical defects in country children (*solid black bar*) and city children (*shaded bar*) based on more than 500,000 examinations. The figures show the number of children affected per hundred. This is the result, partly, of insufficient medical inspection in rural schools and districts; but partly too, of the ignorance and negligence of country mothers. (From the "Progressive Farmer.")

If it is possible, educate your child by very light home work at this age, and give him opportunity for free play. Answer his questions carefully; cultivate his powers of seeing things and his interest in nature; and, if he seems to want to learn, teach him how to spell and read a few words, to tell time, to count, and to make change. If he can begin school with so much knowledge, great will be his gain.

Physical defects. When school life begins, the child should be carefully and lovingly watched. You may be suddenly forced to fear that your little girl or boy is stupid. Do not be too quick to believe school reports. First make sure that your child sees correctly; perhaps his slowness in reading is due to the fact that he cannot see what is written. A pair of glasses has frequently changed a dunce into a creditable pupil. Be sure that the child is not deaf; perhaps his failure to recite is owing to his not hearing the question. Many children who hear poorly are afflicted with adenoid growths which stop up their noses and spread to the ears. Sufferers from adenoids, even when not deaf, have low vitality—are weak—because of disturbed sleep and of loss

FIG. 217. The play spirit is one of the blessings of childhood. It should be fostered, not destroyed. Too many farm boys and girls are robbed of it by drudgery and lack of sympathy both at home and in school

of strength by the mere effort of breathing, and because of the lack of oxygen in the lungs. Children having adenoids may also have enlarged tonsils, which produce an almost chronic state of sore throat during the winter. A simple operation for the removal of these growths will be followed by marked increase in stature and a brightening and clearing of the whole mental life. Be sure, too, that the teeth are sound. Who could study with a vibrating tooth? Decayed teeth, moreover, are a cause of indigestion and general run-down condition. This is due to the poisons which pass from them to the stomach, and which are taken up by the general circulation and passed through the system. Teeth, as soon as they come in, should be brushed twice a day. By the time a child is 4 years old, he should be trained to do this regularly and thoroughly for himself, and to realize the filthiness of decaying matter in the mouth. A sound first set does much to insure the excellence of the second set; for only when the first teeth are clean do the roots come out as they should, leaving free space for the roots of the second set. A good diet and active toothbrushes will usually insure good teeth, but, when these means are not sufficient, a good dentist should be visited.

There are serious nervous troubles whose first symptoms are peevishness, lack of attention, awkwardness, and strange attacks of temper, weeping, or mischief. Before being too stern with the small offenders, consult a doctor.

FIG. 218. The Boy Scout movement is an invaluable means of turning the vigor of youth into useful, manly channels.

The backward child. The mother of the apparently backward child should recall that many a man and woman who has become distinguished in later life was considered dull in school. After making sure that the child's slowness is not due to some physical defect which should receive medical care, the next thing to do is to find something which interests him and which he can do well. Often, such training in one direction not only produces efficiency there, but also leads at last to an understanding of other things. Schools are patterned to suit a certain type of child, so when a child who is different is to be taught, the teachers are not always quick to understand him. Consequently, many a bright child fails to make good progress in school. There is always a way to reach and teach these odd youngsters, and mother and teacher ought to put their heads together to find it.

Stages of moral development. It is a help in bringing up boys and girls to realize that

they pass through certain stages of development which cannot be entirely controlled or very much shortened, however hard we try. For instance, until a child is 10 or 12 years old, he is a loud spokesman for his own rights, and uncomfortably indifferent to other people's pleasure. This is a period of self-assertion, and, frequently, of quarreling. While we must lead our children at this age to restrain their selfishness and to be thoughtful of others, we should, nevertheless, be patient and merciful with them; for every child has to learn the meaning of family and community life. Sharing in the labor of farm and home during early years, is one of the best ways to teach children to work with others.

The poet's age. Children see and hear many wonderful things in childhood's wonderful world. It would hardly be too much to say that every child is a poet for at least a little while. This being so, feed the imaginations of children. Their lives will always be richer and finer if you do. Far too soon we become prosy and matter-of-fact. Let children carry forward a few memories, at least, of companionship with fairies and make-believe folk. They need, too, abundant time for free play with other children whom you know to be wholesome and clean.

FIG. 219. The garden is a splendid place for children to develop in. School and community gardens are especially good since they combine work with pleasure and companionship.

The gang spirit. At 10 or 12 years of age, boys and girls become sociable. They develop the club, camp, and gang spirit. Let your home be a meeting place for them with their friends. Know the children whom your sons and daughters have chosen, and help them to choose rightly. Encourage games, indoors and out of doors. Let the children have little parties. Join with them in camps and picnics. The Boy Scouts and Camp Fire Girls movements have been built upon the gang instinct, and have made it valuable to the children and of real service to the community. It is always better to turn the tastes and desires of children to good account than to suppress them. They are the finest levers we have in the educational process. When, for instance, this gang spirit is let run wild or is not guided, it may lead to crime. If, on the other hand, we show the child how to express his natural instincts in serviceable ways, they become uplifting forces. Sympathy and understanding are the great needs of every parent.

Adolescence. Do not worry greatly over the disagreeable traits of character which your children will surely develop at adolescence, the period when youth replaces childhood. There are great changes going on in their bodies and minds. Balance is upset. Later, though, it will be reëstablished. Give the children plenty of nourishing food; see that they sleep 10 hours a day—out of doors, when possible—and that they are not overworked, yet have duties which will keep alive their sense of self-respect and usefulness in the family plan. If they are moodish, careless, impudent, even bad as can be, remember that they are struggling to find themselves, to get their bearings on new roads. Then it is that they need the best of physical surroundings and lots of patient love—love which asks few questions and demands little in return, but which understands and helps.

Moral forces. If you have been wise, a perfect confidence has existed between you and your children from the beginning. You and they have been

honest together, asking and answering questions openly and with a reverence for truth. This will help at the trying period of adolescence. It will draw them to you.

Your children will have learned, long before this, the need of self-control in food and the reasons for system, order, and cleanliness. They will, also, have many interests in nature and in books, and these will protect and satisfy them in the trying changes from early childhood to maturity.

Work as well as play. As the healthy child grows older, he is not satisfied to play all the time, but wants to have a part in doing things—in work, real or make-believe. If these activities are rightly directed, they will prove of great benefit. It is a good plan to give the little lad on the farm a tiny garden of his own. If he is too young to plant it, he should be helped; but all the work should never be done for him. When the vegetables are ready to gather, the work should be looked after by the little owner of the garden; and with what pride will he proceed! For children, we know of nothing better than garden making. In it there is the pleasure of planning and planting, of watching the vegetables or flowers grow, and of enjoying the fruits of one's own labor. Children so engaged are doing more than keeping out of mischief. In cultivating their own flower gardens they are also cultivating a love for the beautiful. Then, too, the child who is allowed to have his or her own flowers very soon learns something of the meaning of property rights, and will be slow to pluck blossoms from other gardens.

FIG. 220. Ownership breeds self-reliance, pride, industry and ambition. Let the boy or girl have a calf, a pig, a flock of chickens—something to care for, work for and to enjoy the profits of.

Children like to do things for themselves, and always they are doing things, good or bad. Children who scar the furniture with their hatchets or saws, do so because they have never been taught to make better use of these tools, to build instead of destroy.

In springtime, when the sap is up and the bark works best, it is worth while for the father to take time to show his little son how to use his knife in making a whistle. The boy, too, should be taught how to make a popgun from the roadside alder. The building of birdhouses offers still larger opportunities for lessons in carpenter work and character building. In providing a home for the birds, the boy learns the use of tools, is made more familiar with the habits of birds, and comes to think more of them. At the same time, too, he will be made to love his own home all the more. The girl who, while working with her mother in canning and preserving, is allowed to provide small glasses and jars of jellies and preserves for her school lunch, will prove a willing worker. All these little partnerships, whether of work or of play, make for clearer understandings and broader sympathies between parent and child. There is also learned the valuable lesson that there is more pleasure in making many of the things we need than in paying somebody else. The value of time also comes to be appreciated.

Something for his very own. Boys and girls, as they grow older, want to own things that are "worth money," as they so frequently express it. This

desire should be encouraged. A little property for his "very own" has anchored more than one boy to the old home. It is a fine thing to give the boy a pig or a calf or to let the girl have a definite interest in the poultry yard. Always, though, they must be made to understand that ownership carries with it certain duties. The stock or poultry must be looked after. Just here it may be suggested that it is a mistake to give the children nothing better than scrub calves, the runt pigs, or the poorest birds in the poultry yard. It is, of course, all right to let them have these, but they should also have some of the best that the farm affords. Remember, too, when the pig has become a big hog and when the calf has grown to be a cow, that these larger animals still belong to the youthful caretakers, and that the mere act of growing up does not change ownership. If it is desirable to dispose of the larger animals, buy them from the children or give full value in something else. Educate children in honesty and "the square deal." Do not deceive. Never even so much as do what, to the child, may appear doubtful.

As the twig is bent. Because you have been wise, your children will have formed the habit of honest work, and so they will want to be helpful. They will regard themselves as responsible and necessary members of the family. This will give them a just pride and a sense of power and dignity, against which they will be slow to offend by bad conduct.

It is all one logical, continuous story, from the first time that your babies cried for a feeding they should not have, and you saved them from illness by training them to order and self-control, until at last you survey your mature children, and know that they are good. It is in the power of almost every mother and father so to fulfill their responsibilities as parents that their children "eschew evil and cleave to that which is good."

WHAT THE FARM AND FARM HOME SHOULD DO FOR THE CHILD

By Ella Frances Lynch, *of Bryn Mawr, Pa., founder of the National League of Teacher-Mothers; a woman who can see into the future and visualize the needs of the young and the means whereby they can be supplied. The farm is often spoken of as "the best place in the world for children to grow up on." Sometimes it is; often it is not. Mrs. Lynch tells how to make it so.*—Editor.

NOWHERE can the foundations of that education which makes for lasting benefit to humanity and to true happiness for the individual be better laid than on the farm. Here the old-fashioned virtues of obedience, orderliness, patience, promptness, cleanliness, self-control and self-reliance are essentials to success; and the child should, and will, be led to value them, even before his or her schooldays begin. Indeed, on the farm, helpful habits are formed of necessity and almost unconsciously.

The farm is a wonderful kindergarten. The kindergarten is regarded by many mothers as the first step in education; and so it is. The word

Fig. 221. Let the children help. Give them an interest in the work and success of the farm. Treat them as partners, not as hired help.

FIG. 222. As the school has widened its field to include the physical as well as the mental development of its pupils, so the farm should be made to broaden children's minds and characters as well as to strengthen their muscles.

means "children's garden." The most wonderful children's garden in the world is the farm kindergarten—the house, the yard, the barn, and the fields. The family, the household pets, and the livestock furnish invaluable aids and equipment.

We are too apt to think of a kindergarten as a large room with a white circle painted on the floor, around which the children place their little chairs for the morning talk. Because of lack of space and opportunity, this is about the best our schools can furnish. But in many European cities, where they know that the best ordinary kindergarten is only a poor substitute for the farm home, the kindergarten is now a large farm, where the children go in the morning for the day. Here they learn to milk a cow, to care for milk, to churn cream, to plant and tend a little garden, to put up preserves, and in various ways to imitate the work of grown-ups. Can we not have this, each in his own farm home?

Let the children help. Begin by teaching the children to help themselves; to put on stockings and shoes; to dress themselves; to put on hats and coats, even if they have to be adjusted later. Also, give them little tasks about the house, such as using the tiny broom, the brush, and the dustcloth, and let them bring things for the mother. Out of doors they may help in pulling up weeds, gathering chips, in picking vegetables, and so forth. Let the little 5-year-old pick a cupful of berries or currants, weed a tiny garden bed, marking off a space of perhaps a square foot; bring food and water to the old hen and chickens; gather a pan of apples or potatoes; dust the chairs or the sewing-machine, and run little errands for the mother. All of these tasks help in sense training. In drying the dishes, for example, the child learns about china, silver, glassware, heat and cold; and in handling fruits and vegetables he or she notices the difference in the feeling of each.

The habits of promptness and regularity are soon formed. The daily chores of the household and the farm must be done every day, day after day, and on time. "I forgot" does not fill the woodbox. The blackened chimneys and empty reservoirs of the house lamps tell their own tale. If the pigs are not fed, they promptly tell the world of it. Thus the very routine of the farm and farm home teaches the child to be prompt and regular.

Farming is the one industry in which it is right and proper that children should assist from their early years. Indeed, the child carefully trained in the farm home gets a fair education without much schooling. The making of chicken coops, sleds, wagons, and playhouses, and the repairing of fences, all give skill in the use of tools, and this skill is helpful in after life. Children thus learn how to accomplish tasks in the easiest way, with the fewest motions, and in the shortest time.

Let the child begin early to make things. He loves to build houses, and is satisfied with a few sticks laid upon the ground. Let him build ladders, anything he likes, as crudely as he may.

Training the whole child. Well-directed sense training during the first 10 years of life will teach the child to see and hear attentively and correctly, to discern, and to judge. This means the training of ear and eye, and the culti-

vation of the senses of taste and smell and touch, to judge time, dimensions, weight, temperature, color, etc. This sense training must begin before the sensitive organs are dulled by neglect or misuse. The lack of it is responsible for much of the so-called dullness in school.

The wonder world. The little child sits on the doorstep, watching the swallow intent upon flycatching or nest building. No teacher is there to break the spell, because the period is up and the restless class wants to do something else. The child sits by the brook, and floats his chips down. How he watches and wonders, his mind struggling to awaken and ask the questions he does not yet know how to ask. Leave him alone. His mind is expanding as it could not do in the most up-to-date schoolroom. When he asks you where the brook goes, tell him. Answer his questions, if you can. This is the greatest rule of teaching. The child's answers to your questions are not a safe standard for measuring what he knows, but the questions he asks you are the unerring indicator of what he is ready to be taught.

As the child grows older. From kindergarten to the age of 10 is an important period in the life of the child. The aim should be to form the character by developing correct habits, creating the habit of work, and by training the senses, so as to increase the powers of observation. Try to open the eyes of the child to the wonders of the natural world about us.

There must be no seemingly endless tasks, and no complicated lessons at this age. A single direction should be sufficient for any task within the small child's reach; but, once given, the task must be done promptly, completely, exactly as you directed it to be done.

Using eyes and ears. Teach the child to use his eyes. How many legs has the fly, the spider? Do you know a moth from a butterfly, or an angleworm from a measuring worm, a cutworm, or a centipede? Do you know a frog from a toad, or frogs' eggs from toads' eggs? Which creatures are warm-blooded and which cold-blooded? These are some of the questions the child may be taught to answer.

Welcome the birds as they arrive. Talk to the children about the birds' journeyings, their nest building, their choice of homes. Watch for the birds that get mud to plaster their houses, and those that want hair and feathers for lining. Coax the wrens to build in the back porch.

Tell the children about the great tree that grows from a little seed. Show them seedlings. Tell them Æsop's fables of "The Ants and the Grasshopper," "The Hare and the Tortoise," and others. The lessons given in these stories are more effective now than during the kindergarten period.

Say to the child: "Stand with your right hand to the east and your left hand to the west. You are then facing the north. The south is behind you." This will be remembered and applied many times in after life.

Nature a great teacher. Train the child to lead an out-door life. In early times, people lived out doors, and became far more observant of their surroundings. We owe the beginnings of our great sciences to out-door folk who had little knowledge of books. Mathematics, which makes all sciences possible, came to us in this way. Astronomy was studied by the simple shepherds of Chaldea, lying wakeful on the hillsides. They traced the principal star groups and named them, though they had nothing to aid their study but the naked eye and the rich fancy born of life in the open field.

Teach the child to look at the heavens, noting the changes, both day and night. Begin by pointing out a single star and have him watch for its rising evening after evening. It is a great moment for the 9-year-old when he learns that the stars, like our sun, rise and set. Point out to him the Dipper, and

study with him, if possible, some simple account of the heavens, with illustrations, that will help him to know the principal stars. Teach the child to love everything in nature, however humble, abundant, or commonplace.

The value of home training. A young woman entered a state normal school a few years ago, and surprised her teachers and fellow students by her excellent progress along every line of study. She was permitted to complete the usual 4-year course in 2 years, although she had attended high school but 10 weeks. She is to-day a successful magazine writer and lecturer. What was her early history? She grew up on a farm and did her share of work, indoors and out of doors. Fortunately, the home was supplied with good books, so that the curiosity aroused in her by looking at the stars, the flowers, and all living nature could be satisfied in the long winter evenings by unaided study. Until she entered the normal school, however, she had never seen a railroad train, a steamboat, an electric light. Yet, far from holding her back, her home surroundings had helped her mind to develop slowly and naturally, until with maturity came unusual strength.

The Country Boy's Creed

I BELIEVE that the country which God made is more beautiful than the city which man made; the life out of doors and in touch with the earth is the natural life of man. I believe that work is work wherever I find it, but that work with Nature is more inspiring than work with the most intricate machinery. I believe that the dignity of labor depends not on what you do, but on how you do it; that opportunity comes to a boy on the farm as often as to a boy in the city, that life is larger and freer and happier on the farm than in the town, that my success depends not upon my location, but upon myself—not upon my dreams, but upon what I actually do; not upon luck, but upon pluck. I believe in working when you work, and in playing when you play, and in giving and demanding a square deal in every act of life.

—Edwin Osgood Grover.

GIVING THE CHILD ITS SHARE

By Mrs. Helen Johnson Keyes. *The world is being tested by the fires of war and adversity that the powers of evil may finally and effectively be conquered by right and justice. The least that we can do is, each within his or her own little sphere, to uphold and carry out those principles of right and justice in our relations with those around us. And how better can we begin than by giving the children on our farms their full share of life and all that it has to offer?*—Editor.

Fig. 223. Just because it is good fun, testing seed corn by the rag-doll method is no less valuable than any other. Children are never lazy when they are interested; the aim should be, therefore, to keep them interested in the farm and its work.

It is from the partnership of the home that children should receive their just share of training for life.

The American farm offers bountiful opportunities for the rights of young people, for here it is possible for all the members of the family to work together. Unfortunately, however, these opportunities are not always understood and used. We have not learned yet just what the needs and rights of young people are. We forget that they need a great deal of play, rest, companionship and freedom mixed with their work. We even forget that they need us; for do we not silence them when

they express their opinions? Are we not careless about answering their questions? Do we not put them to work with more thought in our minds of the work than of the child who is to do it? This must end, for the best crop of the farm is the children.

The traits of character which our boys and girls need most when they go out into the world are: (1) industry; (2) honesty; (3) affection; (4) the spirit of helpfulness, and (5) the ability for leadership. A training which shall make them strong in these qualities is their just share. But how shall we go about giving it them? Let us see.

Industry. It is easy to make a child work hard, but that is altogether different from training him to be industrious. So long as he works only because we compel him to do so, when our authority over him ceases, he will stop working. In order to make a child industrious, he must see the advantage of industry: he must have a share in the comforts and benefits which come from a task well done.

We have all noticed how eagerly the young child attempts his new task and how, with constant, dull repetition of the labor, his interest wears away. He may continue to be a worker, but probably he is not developing the love of being industrious. Can we not put back into what he is doing something of the old excitement and interest?

The kind of interest which almost always may be put into work is that of invention and improvement. There is usually some better way of doing a thing than the one in which it is performed day after day. Why not suggest to the youngsters that we and they constantly watch for methods to save time and strength while yet improving results? We should talk this over with them, because they are our partners. The child who gets a box and stands on it, in order to reach the sink more easily, puts into dish-washing the excitement of an invention; the boy who learns how to fatten his hogs better than his neighbors will not mind taking care of them; the girl who learns to cut her cloth so economically that the amount of material which she once required for a dress alone will now give her a shirt waist, also, will love to make her own clothes. Moreover, with the connections between work and reward firmly established in their minds, the habit of industry will become fixed.

Balancing work with rest. There is another side to the training of children for a life of industry. We all hate what we get too much of—even kindness and candy! Children certainly will hate work, if it is not relieved by a large amount of rest. Boys or girls who go to school already tired from toil in the early morning hours, following a night of too little sleep for growing bodies, will probably hate work and decide to shirk it by and by. *We may have forced them to work, but we shall not have trained them to be industrious.*

Honesty. We are not giving our children their just share unless we train them to be honest. This we may do by being honest with them ourselves. They learn by copying us; and if we answer their questions with untruths, they will answer us and other people in the same way, no matter how much we may talk about the sin of lying. If we do not know the answer to their question, we should say so, and, if possible, find out about the matter or tell them where they can do so. If we believe that the answer is not suitable for them to receive, we should say so. But let us remember that young people are right in wishing to understand life, and that we, as their closest partners, should be their instructors.

Contracts. Honesty consists of something more than telling the truth. It includes acting fairly and squarely in all the relations of life. Sometimes a

child is given a pig, or a calf, or some land to call his own, to take care of, and to receive the profits from, as he supposes. He devotes time and interest to it and produces something of marketable value. What sometimes happens? His property is taken from him, and the proceeds of the sale are pocketed by the very person who gave, or pretended to give, it to him. This is dishonest. The child knows that it is dishonest and knows, also, that partnership on this basis is impossible. Such treatment is not giving him his share. It cheats him not only of his property, but also of his training in honesty and respect for contracts. It inflicts a permanent injury; for he will think: "Oh, it is necessary only to talk about honesty, then one can go ahead and cheat and break contracts the way mother and father do." And he will decide, too, that there is no such thing as team work, that it is a case of every man for himself.

The Country Girl's Creed

I AM glad I live in the country. I love its beauty and its spirit. I rejoice in the things I can do as a country girl for my home and my neighborhood. I believe I can share in the beauty around me—in the fragrance of the orchards in spring, in the bending wheat at harvest time, in the morning song of birds, and in the glow of the sunset on the far horizon. I want to express this beauty in my own life as naturally and happily as the wild rose blooms by the roadside.

I believe I can have a part in the courageous spirit of the country. This spirit has entered into the brook in our pasture. The stones placed in its way call forth its strength and add to its strength a song. It dwells in the tender plants as they burst the seed-cases that imprison them and push through the dark earth to the light. It sounds in the nesting notes of the meadow-lark. With this courageous spirit I too can face the hard things of life with gladness.

I believe there is much I can do in my country home. Through studying the best way to do my every-day work I can find joy in common tasks done well. Through loving comradeship I can help bring into my home the happiness and peace that are always so near us in God's out-of-door world. Through such a home I can help make real to all who pass that way their highest ideal of country life.

I believe my love and loyalty for my country home should reach out in service to that larger home that we call our neighborhood. I would join with the people who live there in true friendliness. I would whole-heartedly give my best to further all that is being done for a better community. I would have all that I think and say and do help to unite country people near and far in that great Kingdom of Love for Neighbors which the Master came to establish—the Master who knew and cared for country ways and country folks.

—JESSIE FIELD.

Affection. We love what is lovable. That is a simple truth, but it is often forgotten. We have an impression that we love what we ought to love; that children particularly, unless they are very wicked, will love all their near relatives and their home, because that is a nice and proper thing to do. But we are mistaken. They will love them only if they are lovable—that is, cheerful, fair, and kind. It is a hard and brutal fact, one which it would be more pleasant not to have to admit, that some children never love their fathers and mothers much. On the other hand, it is natural to every normal boy and girl to love them very dearly, and when he does not it is usually because his affection has been repulsed. The parent does not intentionally repulse it, but he neglects those claims to respect and consideration which are the children's share. He forgets, perhaps, that they need friends of their own ages and that they wish to bring them into the home; he forgets that boys and girls require a little spending money for the use of which they do not have to account carefully. He does not ask them what color they think the barn should be painted, or what their ideas are as to fencing. Unless boys and

Health, strength and a realization of the necessity and importance of work are invaluable riches that the farm holds out to children

Nowhere better than on the farm can the wonders and beauties and mysteries of life be encountered and explained

THERE IS NO BETTER PLACE WHEREON TO RAISE CHILDREN THAN THE FARM; IT SHOULD BE MAINTAINED, THEREFORE, SO AS TO HOLD THEM AND THEIR INTERESTS THERE

Boys and girls should receive a share of the profits in proportion to the part they played in making them, as a just return for this sort of spirit, regardless of its result

The farm home can provide a more varied, more generous diet more cheaply than any other household. A practical knowledge of how to make it do so is invaluable

THE FARM IS THE HOME AND SUPPORT OF ALL WHO LIVE ON IT; WHY NOT GIVE EACH, DOWN TO THE VERY YOUNGEST, HIS OR HER SHARE IN ITS DEVELOPMENT AND OPERATION?

girls are taken into partnership in the life and decisions of the farm home, their hearts will wander far from it.

And what a serious loss that is! It would be better to send a child on a journey half-clothed than to send him out into life without the love of home in his heart. If he does not learn the habit of affection on the farm, he will scarcely know how to form the friendships and partnerships which make later life strong, beautiful, and successful. He will have been robbed of what was his share in youth.

Parties. Let us show the boys and girls that the farmhouse is theirs as well as ours. Birthdays and other special occasions should be celebrated with parties. A crowd of young people and something to eat are a party already. If anything more elaborate is desired, there are books showing how to play games, charades, and so forth. Many of the farm papers and women's magazines give such suggestions, too.

Rooms. Young people should be free to bring their friends into the home at almost any time. They should have their own rooms, in which to keep their treasures and where they may see their friends. There are large farmhouses in which children cannot tell from night to night in what bed they are to sleep; who have only the space they can find in other people's clothes closets where they can keep their things. Children treated in this way certainly are not receiving their just share of the home, and it is not likely that they will be fond enough of it to stay there when they reach the age of independence.

Give a girl an almost empty room, freedom to use what she likes out of the attic, a few dollars, and a little time, and see what she will make out of them in the shape of a room. And see, too, what that room will make out of her in the shape of a happy, efficient home girl.

There is a general idea that boys do not care about nice things. It is true that they do not want "girly" things; but, if we give them a den of their own, they will soon fill it with school trophies, collections, chums, and laughter. We should let them have plenty of drawers and cupboards, and give them a good mirror and decent washing arrangements. They will appreciate these, and feel that we really want them as partners and that we are helping them to make themselves fit. The spirit of affection will bless the home.

Spending money. Every child should have some job for which he is paid, and the pay should be the same that we would give a stranger of the same ability. Nobody who has not a little change in his pocket can feel much self-respect. Instead of paying in cash, it is sometimes better to lease boys or girls some land, allowing them what profits they make.

The spirit of helpfulness. Little children love to be helpful, or what they consider helpful. But it is sometimes hard to be patient with their slow, unsatisfactory efforts. In fact, in a busy home, it may be impossible to wait upon them. Yet to say again and again, "Oh, you don't know how; I'll do it," is to refuse them the training which is their share. Without such training, they will grow into the boys and girls who allow their elders to shoulder all the hard work while they stand by. We blame them, but the fault is ours. Every age beyond infancy has its powers of real service, and we should give to each child work to which he is suited. The fact must be impressed upon the child that he is helping; that every one must help, in order to get on in life and to be happy and decent. So all fit in together, and there is no feeling that "Mother would rather do it herself." This training may cost us time, strength, and property for a number of years; but, unless we give it to our children, we are not granting them what is their due. Life has little use for the man or the woman who has not been trained in the spirit and habit of service.

The ability for leadership. The cry of the countryside is for leaders—men and women who will stir their communities and organize them into working units for better homes, farms, schools, churches, and health.

Comradeship. The spirit of leadership is born of comradeship and play. This may seem a strange statement; but, indeed, it is a true one. Young people measure their strength against one another; they find out their weakness and their strength by contests, intimacies, and even fights. Although they get much knowledge out of textbooks, and much polite behavior from the instruction of

FIG. 224. The farm girl should have her own room in which she can and will take pride, and learn invaluable lessons in neatness and good taste.

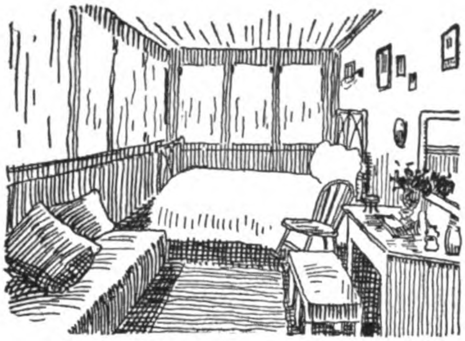


FIG. 225. A simply, inexpensively finished and furnished room that the boy knows as all his own, will do wonders in keeping him on, and interested in, the farm.

their elders, their most vital, developing education comes from personal experience; from discovering, for instance, how the boys and girls of their village regard certain acts; what are the consequences of these acts upon their lives; and what public opinion has to say about the boy or the girl who does not play fair. These things are life—life under a reducing glass, but real, true life, nevertheless.

Fights. No grown-up is capable of giving a boy all the education he needs. His playmates must give him a share of it. So will he learn to work with other men, to control himself and them. Without friends, freedom, and fights he will not have had his share of preparation for life.

Play. It is important to remember that a child's play differs from the recreation of men and women. A child's play is a form of work, an imitation of the activities and labors of mature life. Children play school, store, motherhood, and war. Play prepares them for the business of later years.

Large cities have awakened to the fact that their criminal classes are, to a great extent, made up of men and women who, as children, lacked the time or the place to play. At large expense, therefore, cities maintain playgrounds and parks where men and women are employed to teach boys and girls how to play. Because these children have not meadow and brook, hill and river, many sorts of machines are set up on these grounds for their exercise and amusement. Now, the country has the most splendid opportunities for play, but too often it has neglected them. It must admit the mistake and teach its children to play, or, rather, give them the time and liberty for play. Machines and instructors are not so much needed by country children as by city children, although on the school playground these have their place. The trout brook, the woods with their four-footed creatures, the trees with their fruits and nuts, the hills, the millpond, the river are better than anything that a factory can turn out. Well may we give our boys and girls a half-holiday every week, and a week or two every summer for camping, and see how much reverence for the world of nature, how much self-control, and how much knowledge of people they will gain by these experiences of play. Thus the country, too, like industry, will have its "captains," who are strong and wise in the management of men and women and in the organizing of country forces for the highest expression of country life. If we give our children their share of play, they will, in turn, teach the country to yield to us and to themselves the full measure of prosperity, education, health, and amusement.

Reading. Boys and girls who are not given opportunity to read are not receiving their share of life. In our desire to make our children's reading "improving," we are in some danger of making it narrow. The person who reads for information only, may be a splendid student, and successful in a chosen occupation; but he will not be a leader. Farmers' bulletins, farm papers, agricultural and home-making books certainly ought to be read by every farm family; but, unless boys and girls, in addition to these, are taught a wider use of literature, they are not being trained for the broadest life.

The very best way to teach young people the joy of reading is to turn them loose very frequently in a library which has collections suitable to different ages and tastes. Here they should be allowed to handle books freely, reading little or much of them, just as they desire, thus learning for themselves what they prefer. An occasional suggestion from an older person will be helpful, but "courses" prescribed by grown-up instructors are apt to kill the fine flavor of adventure which comes from wandering at will through tempting volumes.

So far as possible, let boys and girls choose their own books, after you have placed good ones within their reach. So-called "boys' books" are the best reading for girls, too, because they fire the spirit with a desire to be a hero, instead of ripening at too young an age the desire for lovers. Even the so-called "blood-and-thunder" stories of adventure, in which many maturing boys delight, are probably less harmful than the sentimental, goody-goody, falsely romantic stories in which too many maturing sisters have delighted.

However, if boys are fed on the right kind of adventure tales, written by the great masters of story-telling, and if girls, too, grow up with an admiration for ancient deeds of bravery, neither will crave objectionable literature. On the other hand, a boy or a girl with an imagination, whose reading has been limited to what grown-ups consider improving, is very likely to rush off explosively some day into the book world of exciting piracy, crime, and love. It is our fault; we have not

allowed a just share of what youth craves.

The opportunity to borrow books from public collections has brought the big world right into the farm home. Yet there are certain books—little slices of the world which we want to own rather than borrow, which we love and wish to own, keep, and reread. The children, too, should have a shelf for their own favorite stories.

If we have been able to turn the children loose among many books, they will know what they want to own; if not, we must depend on the teacher or the librarian to help in making a selection. In choosing, there are three facts to remember, which are often overlooked when old heads try to be wise about what children will like.

The first is that children are not, as a rule, interested in stories about children. They want fairies, heroes, and great deeds. This is especially true of boys. The second is that books for children must have pictures. The third is that children pass quite definitely through three stages of taste in their choice of reading matter: (1) Fairy tales and tales about talking animals. The love of these begins before they read to themselves and continues till they are 8 or 9 years old. (2) Legends and stories of knights, kings, courts, and ancient battles, and true stories about animals, especially wild ones. These fascinate them up to the age of twelve. (3) History in its purely story form—mainly deeds of brave pioneers, soldiers, and inventors. The enjoyment of these may last into adult life, or it may be followed by a real literary taste and judgment, leading through any of the book paths of the grown-up world.

BOYS' AND GIRLS' ORGANIZATIONS ON THE FARM

In discussing ways and means for making child life on the farm richer and more fruitful, it must not be forgotten that already a good deal has been accomplished in that direction along several lines. One of the most successful developments has been that of the club work among farm children which has served to keep many a boy and girl close to and interested in the farm. The first part of this article briefly describes the nature and development of the work. The second part, sketching some of its results, has been especially prepared for FARM KNOWLEDGE *by* MR. O. H. BENSON, *of the Department of Agriculture, who for several years has been a national leader in the work, and who has, therefore, had unequaled opportunities for studying its effects, not only upon club members, but also upon all with whom they have come in contact.*—EDITOR.

WHAT they are. The desire of boys and girls on farms to possess something—a pig, a hen, or a piece of ground—for their very own has led to the organization of a large number of clubs in all the states of the Union. The United States Department of Agriculture, cooperating with the state agricultural colleges, has given considerable attention to their promotion; and the movement spread with such rapidity, since it was begun (about 1906 in the southern states and about 1912 in the northern states), that by 1918 more than 1,500,000 boys and girls were enrolled as members in the various organizations, which include the following projects: alfalfa, corn, farm-and-home handicraft, farm-management, forage, home-garden and canning, home-management, market garden, pig, potato, poultry, sewing, and sugar beet clubs.

State leaders in club work, paid partly from Federal and partly from state funds, work mainly through the county agents, club leaders, county superintendents of schools, and local teachers. The members of the clubs also receive complete instructions by mail both from the state colleges of agriculture and from the Department of Agriculture. Thus the corn clubs are taught the best way to fertilize their plots of ground, to select seed and prepare the seedbed, to plant, and to cultivate, while the girls are instructed how to handle their patches of tomatoes or other vegetables, and how to can or otherwise dispose of the product.

The pig club as an example. Perhaps the most interesting of the animal industry clubs are the pig clubs, which, in 1917, numbered more than 10,000 members. One of the first boys' and girls' pig clubs was organized in Caddo Parish, Louisiana, in 1910, with a membership of 59 boys, as an outgrowth of the corn-club work. The objects of the club were "to interest the boys in swine production, to teach them improved methods of raising and fattening hogs, the value of forage crops, sanitation, good management in handling swine, methods of home curing of meats, and, by means of the pig-club

work, to give the boy a broader and better view of farm life, thus making of him a better future citizen."

Each club member is required "to secure a pig or brood sow, and feed and care for it according to instructions, keeping complete records of the amount of feed consumed, the gains in weight, cost of the gain per pound, breeding records, etc." The pig-club work is divided into two principal sections: (1) that of raising litters of pigs, and (2) that of fattening hogs for home consumption or for market. Annually, at the state fairs and elsewhere, exhibits of pig-club pigs are held.

FIG. 226. A pig-club member and his prize-winning entry. He and his father started even, with equally good animals. The man fed his as he had always done; the boy practiced modern advanced methods and turned out a far better, larger animal in less time.

How eagerly the project is taken up by the boys may be gathered from the fact that at Midland, Texas, a lad of 6 years secured a purebred pig and applied for membership. He was too young for admission, but, undiscouraged, he persevered with the feeding of his pig according to the regulation instructions; and, when the fair of 1915 took place, the pig, not quite 11 months old, weighed 450 pounds, securing, in certain classes to which it was eligible, no fewer than 5 blue ribbons besides $25 in cash.

Educational value of pig-club work. Perhaps the most remarkable result of pig-club work is its educational value both to the members and to their parents. Many farmers, after seeing the results of their boys' pig-club work, have changed their methods of handling hogs, with considerable pecuniary benefits to themselves. Also, on the children themselves the educational influence of the clubs is noteworthy. The Year-book of the Department of Agriculture for 1915 cites the case of "two boys who were somewhat dull and who disliked study and books in general, with the result that they always stood near the foot of the class, despite the efforts of teacher and parents. Both boys joined the pig club, secured pigs, and . . . read all instructions furnished either in the bulletins, circular letters, or personal letters. . . . Each read everything sent to him and finally began reading and studying other matter, with the result that these boys were among the best pupils at the close of the school year."

What has been said of pig clubs with reference to their influence on the members applies more or less to poultry, corn, canning, bread, garment making, and other clubs. Especially is this the case from the educational standpoint. A Texan county school superintendent reports that boys and girls who were club members did 23 per cent better in composition, 16 per cent better in spelling, and 11 per cent better in other subjects than the other boys and girls. Also that of more than 4,000 boys and girls in the rural schools of his county not a single member of a club had been suspended. There is a better attendance among club members, too, by 5 per cent at church services and 7 per cent at Sunday schools, than among other children.

Boys' and Girls' Club and Farm Project Work

(*By* O. H. BENSON.)

Its far-reaching results. Through this method of education, boys and girls are led naturally to a proper appreciation of the ordinary activities of the home and the farm. This comes through contests, the club group, achievement-day programs, the privilege of winning and wearing achievement medals, banners, and pennants, the participation in club yells, songs, and the like. It is easy to understand why all the "stingers of farm drudgery have been pulled," and hard work has been transformed into interesting contests or work in which children love to have an active part. This type of work is based upon the belief that, if young people are given sympathetic and efficient human leadership in their work and the latter is properly staged, such work will become as interesting as the hard work connected with football, baseball, lawn tennis, and field

sports of every kind. To require a boy to work 10 hours per day in plowing, cultivating, milking, and choring, all without spirited leadership, without play, without contest, and even without the school recognizing this type of work as a standard of achievement worthy the real man is not reasonable; and it is easy to understand why he will wish to leave the farm and its tireless, endless drudgery.

Club work has for one of its cardinal virtues the teaching of ownership as well as partnership in farming and homemaking. In addition, it assigns to every child a man's or a woman's job, and lets the children know that they will have a chance to do such a job and win laurels from, and the favorable commendation of, their elders.

FIG. 227. A city boy member of a canning club. Even a backyard garden paves the way to this kind of training and education.

Many thousands of boys and girls every year have, through corn, pig, poultry, garden, canning, and garment-making projects, made net profits, on their own money and energy invested, far in excess of the profits made by their fathers and by their adult neighbors. These net profits have become their own bank accounts, or their investments in pure-bred stock, acres of land, good machinery, kitchen or household equipment. Junior farmers, through this type of education, are able not only to study the theory of the germination, growth, and development of a grain of corn, but to learn its real lesson by means of a concrete demonstration on the soil and in the market; and they have found out that the investment of skill plus knowledge in farming is what makes for the greatest net profit per dollar invested. In this type of education, the child is unhampered by years of improper habits in farming and home making. Training in school includes how to study, to apply knowledge, to follow instructions, and to take directions from others. This makes it possible to get 100 per cent value from instruction through club and home project activities.

This type of work operates along the line of giving thrift education through the production of money or other wealth. No one has ever learned properly how to save a dollar until he has first learned how to produce that dollar by means of his own investment of time, money, or energy. Thrift is a by-product of earning.

If it is worth while for adults to organize themselves into granges, women's clubs, societies, lodges, and the like for social and educational advantages, it is even more important that some form of organization be offered to children with a view to their more complete education as social and coöperative units representing the community and social ideals of the future. To encourage the organization of coöperative groups of men and women and to deny such privileges to boys and girls is unfair to the future American.

The training for leadership and coöperative efficiency is one of highest importance in the education of our boys and girls. It is, therefore, simply a matter of common sense that we give to the boys and girls ownership, a liability and a motive for their study and industrial achievement, a coöperative interest not only in their own work, but in the whole business of farming and home and community making.

Leadership and organization. The boys' and girls' club work is financed (1) by the Federal Department of Agriculture through its annual appropriations from Congress; (2) through the Smith-Lever appropriations, which authorize the coöperative extension work of the Department of Agriculture with state colleges of agriculture in all states of the Union; (3) by state appropriation acts for extension work; and (4) by special appropriations, as those for

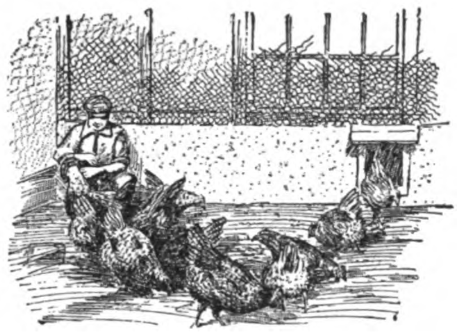


FIG. 228. A poultry club member and his flock. The best of this kind of work is that it pays while it teaches

food production and food conservation, when emergency demands. All these funds are supplemented by county and local funds. In connection with the expenditure of these funds, the United States Department of Agriculture employs leaders and specialists who direct the nation-wide work. They assist in the preparation of literature, the holding of training schools for leaders, the preparation and approval of project agreements, project programs for the different types of work undertaken, and in the general supervision and direction of the work throughout the country.

In coöperation with the state colleges of agriculture, leaders in charge of the boys' and girls' club work and other forms of junior extension work are employed together with their assistants, specialists, and district and county club leaders. In the local community, the boys and girls grouped on a certain or definite project are organized into a club, a volunteer leader is selected, and he gives instructions for the immediate needs of the work. In most of the counties in the various states, there are leaders who direct and supervise the boys' and girls' work. It is their particular duty to join up and fit in their work with that of the county agricultural agent, the home demonstration leader under the direction of the county farm bureau which is the parent organization within the county. The relation of the county club leader with the boys and girls in this type of work is very much the same as that of the county superintendent of schools to the teachers and the children who attend the schools of the county. It will be of interest to know that, in most cases, the county club leader and the county superintendent of schools plan their work together, and thus form a very effective team, in the interest of practical agriculture as well as revitalized school work. The coöperation of the teacher and the boys and girls of the farm and in the home makes the work in the schoolroom as well as that on the farm more effective, practical, and interesting. Thus do the future farmers and homemakers of our country find a new motive for their daily duties.

FIG. 229. A Boy Scout camp in which are developed the same traits of independence, self-reliance and industry as are gained from an interested life on the farm.

Club work furnishes the opportunity and machinery for practice, and carries the work through the week-end holidays and summer vacations. The school, during the 9 or 10 months of its duration, is able to give a great deal of subject-matter instruction and to reinforce and make more practical the courses and studies in vocational agriculture.

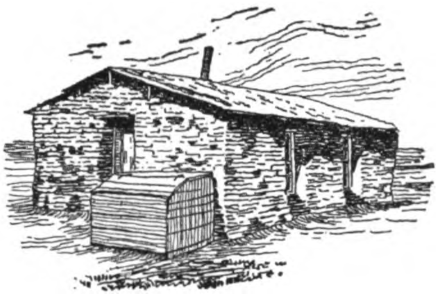


FIG. 280. Many a farmer of an earlier generation got his education—when he got any at all—in a sod school-house like this

CHAPTER 14

Modern Education for the Farm Boy and Girl

THE time has passed when the farmer could rely solely on the strength and skill of his hands and his body to bring him success and prosperity. With the gradual recognition of farming as the complex, scientific business that it is, has come, also, the realization that the well-equipped, well-trained brain and its careful, constant use, are equally, if not more, essential factors in agricultural progress. In other words, the modern farmer, no less than the skilled worker in any other professional line, is ready for, needs, and demands education.

Not many years ago the comparatively few determined men who spent two, three, or four seasons at an agricultural college received, upon graduating, not only their diplomas, but also the unsympathetic, scornful laughter of those "practical" men whose prejudice against "book knowledge" was equaled only by their ignorance of what it taught and really meant and offered.

To-day, the result of education is seen on farms in all directions: it is echoed at meetings of farmers everywhere; it is at the bottom of the farmer's rise into positions of service and responsibility in the interests of his community, large and small, local and national. More than this, it has in several instances been actually measured in terms of the most convincing type—namely, cash profits. Prof. O. R. Johnson of the University of Missouri, by analyzing the records of some 600 farms in a typical farming section, found that of the farm operators who were losing up to $500 per year, but 15 per cent had received more than rural school education; of those making from nothing to $200, 13 per cent had progressed beyond the elementary grades; of those making $201 to $400, 12 per cent; of those making $401 to $600, 14 per cent; $601 to $1,000, 16 per cent; $1,001 to $2,000, 25 per cent; over $2,000, 44 per cent. In other words, the largest proportion of the better-educated farmers was found among those making the best incomes.

As the result of a similar investigation of the affairs of a much larger number of farms in central New York, Prof. G. F. Warren of the Agricultural College of that state, found that those farm owners who had gone only

to district school were making annual labor incomes averaging $318; that those owners who had gone to high school were making $622; and that those who had received more than a high-school education were making a labor income of $847. Upon such a basis, "a high-school education is worth as much to a farmer as $6,000 worth of 5-per-cent bonds."

This is the crude, business aspect—the aspect which, perhaps, makes the best entering wedge for the discussion of the subject as a whole. But there are other reasons than an increased ability to make money that make education worth while—indeed, worth fighting and sacrificing for. Some of these are discussed at some length in this chapter; others, merely mentioned, the reader can rediscover and elaborate for himself.

The chapter includes also a brief descriptive survey of the agencies and sources through which the boy and girl of the farm—and the man and woman, too—may prepare and equip themselves mentally for the life they are given the opportunity and privilege of leading. In its breadth of purpose, depth of importance, width of interests, and height of nobility, farm life is more worthy of all the very best that is in them than they ordinarily realize. That it may often have appeared sordid, monotonous, fruitless, is probably true; but to eyes and minds opened and enriched and broadened by education, it need never and should never appear so again.—EDITOR.

THE VALUE OF EDUCATION TO THE FARMER

By FRED H. RANKIN, *farmer and educator, who has been a member of the faculty of the University of Illinois and in charge of its Agricultural College of Extension since 1901, and Assistant Dean since 1911. For 15 years he owned and operated a central Illinois grain and stock farm; for 12 years he was Secretary of the Illinois Livestock Breeders' Association. He has been and is an institute lecturer in several states, and a contributor to the agricultural press as well as an author of university extension publications.*—EDITOR.

BY EDUCATION I mean that training which fits men and women for all the duties of life. So-called practical business and education are getting closer together. The day seems to be dawning when specialization in education will be the rule. Agricultural or commercial life is different from professional life; and, therefore, the education for each should be different. The right kind of education pays. A man's worth as a citizen depends upon his brain power and the use he makes of it. From his head down he is physically worth but about a dollar and a half a day. If he is worth more than that, it depends upon what he has stored away in his head and the use he makes of it.

Studies made by the United States Bureau of Education show that at 25 years of age men who had spent 4 years in high school were receiving $860 per year more salary, and that in the 7 years' work following a high-school course they received $2,225 more money than the men received who left school at 14 years of age and had been working for 11 years. Do you know that each day a boy goes to high school and improves his time he adds $9.25 to his earning capacity? Unless a boy can earn $9.00 a day, he had better go to high school as a matter of simple business. And yet over 80 per cent of our boys and girls have been leaving school before reaching the high school. Education pays in dollars and cents, to say nothing about what it means to your farm, your business, and your community in the way of increased efficiency.

What is a boy worth? The accident-insurance companies say 2 eyes are worth $5,000; 2 arms, $5,000; 2 legs, $5,000—a total of $15,000. A thousand

boys and girls figure up, in round figures, an investment of over $15,000,000. This, plus good health, ambition, perseverance, and determination to do something worth while in the world, makes an asset beyond all price. What are you as an individual or a community doing to get the best out of your boys and girls? Are you helping them to start right? Are you preparing them to fit into the world's work? *Are you training them for citizenship?* Think it over!

FIG. 231. Let the education of farm boys and girls deal with those objects and problems which will largely make up their later workaday lives as well.

A vision fifty years hence. Every farmer and every business man should look into the future and ask himself this question: "What will my farm or community be 25, 50, or 100 years from now?" The answer is: "It will be just what we make it—we who live here." Self-satisfaction and contentment with present conditions are the great bars to progress. To quote Professor C. M. Burritt, "There exist in every community the forces and ability to solve that community's problems. They may be, and frequently are, undeveloped, but they are none the less there. These forces must be sought out, stimulated, trained, and developed and then applied to problems of the community."

If every boy or girl could truthfully say, "Somebody in this community is interested in me," what a wonderful thing that would be. Perhaps it is the young person next to you who needs the advice of ripened experience. The thing to do is to lend a guiding hand and to help the boy and girl before they get on the wrong track. The same misdirected influence and energy that land the boy in the reform school or the penitentiary will, if rightly directed, put him in line for good citizenship and make him worth something in this world. In the majority of cases, the wrong person had got hold of that boy at the critical time. The acquiring of the right kind of ideals and training for efficiency will help boys and girls to find their places of greatest usefulness.

A country's greatest asset is its people. American agriculture is being made and developed by its men and women. This land of ours was not worth anything when savages roamed over it; but, as it became settled and developed by an intelligent people of vigorous thought and well-trained minds, there followed the blessings of civilization, democratic freedom, religious liberty, and a home-owning and home-loving people, the very safety and permanence of which we are now fighting for. The surest solution of present problems in agriculture is the giving of encouragement to all phases of agricultural activity. The boys and girls of to-day will run the farms and manage the homes of the future. They must be educated in the accumulated knowledge of our best farmers and agricultural scientists. This is what real agricultural education means.

Lay plans for human efficiency. Our most progressive agricultural students and wisest legislators are arranging to provide the best in educational facilities. This good work is seen in more liberal appropriations, both state and Federal, for the improvement of agriculture, and in the work of the farm-

FIG. 232. A poor country school in which the lack of inspiration, adequate facilities and physical comfort makes effective mind and character building almost impossible.

ers' institutes, the establishing of extension schools, the appointment of county agents, community advisers, etc., whereby the more scientific truths concerning the fundamental knowledge of producing crops and raising livestock are brought within easy reach of the farmers. These agencies, if rightly improved, together with the hearty coöperation given by our public schools in vocational training, will bring greater efficiency to the producing class of the future. But, to insure such conditions, the farmer must keep pace with all other classes in financial, social, and educational development. The farmer of the coming decades must know more of the care and treatment of soils, of the mixing and balancing of rations for feeding livestock, and of the marketing and best manner of disposing of his products.

Business management on the farm must receive more attention. The idea that we have worn out our soils at this early stage of our national existence is all wrong. These acres, depleted in fertility by ignorant and careless methods, can be made more productive by judicious and intelligent work. Our soils are not worn out; rather it is some of our methods that are worn out. With the proper application of scientific knowledge, as taught in our colleges of agriculture, combined with the best experience of our most successful farmers, properly applied, we can materially increase the productive capacity of our land.

FIG. 233. The rural school does a big enough work to deserve a healthy, attractive, accessible site.

The time is at hand when we must avail ourselves of every agency that will help us to enlarge our production, so as to meet the increasing demands made upon us by a rapidly increasing population and a world-wide food need.

Do not be a misfit. Among the greatest tragedies of any community are the "misfits"—men who have not been able to find themselves because they were not trained or fitted to do any particular kind of work. There is urgent need of trained and thinking men and women possessing boundless enthusiasm, and having high ideals, intellectual and moral. In each successive decade there is a smaller sphere for the uneducated man, and a diminishing possibility of success for the man who does not read and think. The reading man is in the saddle. The thinking man is guiding our nation's destinies.

To every young man comes this personal question, "Will you embrace the opportunity afforded by the agricultural college, the experiment station, and all other agencies that are or may be instituted by our state and National governments, to go forward to higher, nobler, and better farming?"

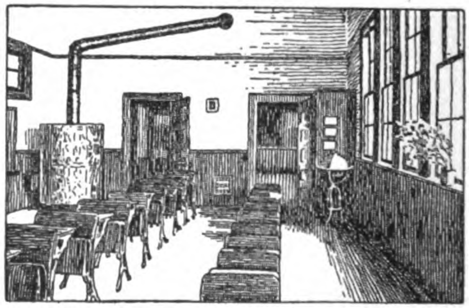


FIG. 234. Like that in Fig. 232, this is a small, inexpensive one-room country school, but its correct lighting, first-class equipment and cheerful atmosphere enable it to do all that the other finds impossible.

DISTRICT AND CONSOLIDATED SCHOOLS

By MRS. HELEN JOHNSON KEYES *(see Chapter 10), who acknowledges that her deepest interests are wrapped up in the problems of giving farm boys and girls a better chance. Whosoever is thus interested is well fitted both for the careful study of conditions as they are and for the formulation of plans for new conditions as they might and should be. The district school has long been the first spring at which the child of the country could obtain draughts of knowledge. Often these were scant and insufficient; often their source was choked with limited means, lack of interest, poor location, and other disadvantages. However, the district school played and is still playing its part; and its work, its advantages, its disadvantages, and its accomplishments, as compared with those of its "big brother" the consolidated school, make an interesting and profitable subject for review.*—EDITOR.

IT IS the function of the country school to create, train, and maintain an efficient citizenship on the American farm. The school owes its service not alone to the families represented in it, not alone to the district, county, or state, but to the entire Nation.

Changes in Educational Ideas and Methods

The old order. At the beginning of our history, the farm home was a little world within itself. The farm family made all the cloth and clothing required for its own use, relied almost wholly upon the farm for food, did its own carpentering and blacksmithing, and was, in short, independent of all other farms and all other industries. The little district school supplied, during its short and broken term, about as much learning as was of use to the men and women whose lives, almost from infancy to old age, were spent in home pursuits. In those days, the farm itself was the real school.

Country life then began to change. By the year 1865, all the work of growing wheat and corn, except the husking of the latter, could be done by machinery. The labor power of one man was thus greatly increased. Thousands of miles of railroad and telegraph wires covered our country, and people began to have more to do with one another. Soon products traveled over the whole world. Refrigerator cars, installed in 1869, made possible long-distance freighting of perishable crops. The farmer became a merchant, as well as a tiller of the soil; and he needed to have a new body of knowledge for this work.

A drift to the cities began. By 1890, farm tenantry had become a serious problem. All this time much of the soil, poorly cared for under a short-term lease system, was growing poorer, and the tenant, getting little profit out of it, went from one farm to another. Under these conditions, he had little interest in community life or in book education. In fact, he had no time for these things. So the country schools became of still less value to the country child, owing to the fact that the studies and methods were copied from city schools. The fact that as the twig is bent the tree grows was lost sight of. All this time country-born children were going to the city. It would have been stupid of them not to do so; for their education had prepared them to succeed better as tradesmen, clerks, or mechanics than as farmers.

The new idea. Then the nation woke up to the harm it was doing itself by educating its boys and girls away from the farms. A new kind of rural school began to appear—a school where agriculture was the soil in which all the studies were rooted. This type of school met with opposition, even from the parents of farm children, for they themselves had been trained by the citified rural schools to feel that farm knowledge is inferior to what the town teaches. Fathers and mothers wished their boys and girls to go to the city, because they believed city life to be easier and, somehow, finer.

FIG. 235. In eight district schools in one Ohio township were held, one year, 46 daily classes of one pupil each. On a basis of cost alone such education is inefficient.

But, little by little, two facts were made plain. The first was that by following certain laws and by cultivating the farm in certain ways, the labor might be made lighter, the income larger, and the freedom greater. The second fact was that putting agriculture in the school course did not mean that only farming was to be taught, but that the laws and sciences on which farming is based were to be made the means of teaching not only farming, but a great deal more.

The teacher. There is no longer any question but that this new method and the new course of study are good things; but many problems remain to be solved, and there are difficulties to be overcome. Chief among these difficulties is, perhaps, the scarcity of teachers prepared for the task by the right experience, tastes, and sympathies, as well as training. Summer schools and special courses of education are open to them, where helpful training may be secured. Without doubt, however, rural-school teaching requires much more than mere knowledge. The teacher must love country life and must understand country people. For the best work, to knowledge must be added zeal, enthusiasm, and earnestness born of the heart. The girl who is merely supporting herself till a city position offers, or who is able to put up with life in the country only by the relief of week-ends in town, may do more harm than good. The city provides plentiful entertainment for those who are empty-headed or who are unable to amuse themselves. The country, on the other hand, demands of the people that they learn to provide their own amusement and pastimes.

The consolidated school. Formerly, in the country, we had only the district school. There was but one teacher; and the pupils all lived in the district, which extended from 2 to 4 miles in each direction from the little schoolhouse. Later, the work of this one-room school was increased by the creation of the consolidated school.

The advocates of the consolidation of a number of ungraded schools into one central, graded school, equipped with scientific apparatus, urge that only by this method can sufficient funds be secured to put into operation the most effective teaching. On the other hand, many parents object to their children having to go to this more distant school, which keeps them from home all day, frequently subjects them to extreme cold, and sometimes exposes them to bad moral influences within the closed vehicle in which they ride to and from school. On these daily journeys, one evil child or an intemperate or vicious driver may exert a very harmful influence. However, the dangers of exposure to cold and to evil influences may be met. The wagon may be heated by a small, perfectly safe furnace, offered on the market for this purpose, or hot bricks and heavy rugs may be used. There are trustworthy drivers who can and must be chosen for the task. All-day absence of the children from home is unfortunate; but, when they weigh this disadvantage against the advantages of a hygienic building in which the children may do the best work, and where the courses of study are such as to help farm boys and girls to become efficient farmers and housekeepers, most parents will feel that the sacrifice is worth making.

On the whole, consolidation of the rural schools—the joining together of two or more districts—has been and is the most important movement in the education of the farm child. The average one-room school of the district or township has not been able to hold the majority of its pupils for more than 4 years. Why? Because the farm child, who is in close touch with practical things, condemns as a loss of time schooling which has no direct effect in fitting him for his life work. Generally, the district-school term is short. Attendance is often light and irregular, partly because of lack of interest, partly because of heavy farm and home work, and partly because of impassable roads at certain seasons. So the work of the average one-room school is poor.

On the other hand, the consolidated schools are well attended; they retain a very large number of pupils between 14 and 18 years of age. Where the consolidated plan has been tried, there is no inclination to go back to

the old type of school. On the contrary, consolidation, which has the approval of the best educators, continues to grow in favor.

Professor A. W. Nolan (p. 276) says of the consolidated school: "The consolidated elementary school, by the very nature of its organization and supervision, is in every way better prepared to give more satisfactory instruction in agriculture, as well as in all other branches of study, than is the one-room district school.

" 'What the best and wisest parent wants for his own child, that must the community want for all its children. Any other ideal for our own schools is narrow and unlovely; acted upon, it destroys our democracy.' These words of John Dewey strike the keynote of education in democracy. The growth of the consolidation idea is an indication that our rural communities are seeking to give all the children of all the people the best opportunities for education that they are willing to improve. We must not, however, be misled into the belief that it does not cost more to maintain a consolidated school than the district system. All improvement costs something; and when we learn from statistics that the cost per head of the education of the city child is, in nearly all instances, twice that of the country child, we cannot, in justice to the country boys and girls, object to the added cost of the consolidated schools. So long as the ordinary one-room district school remains the sole educational center for country boys and girls, we shall go from bad to worse in rural life, no matter how many farm experts may be employed, or how profitable farming may become, as no one will rest content to have his children go out into a world of fierce competition with only one half or two thirds of the education accorded to other boys and girls.

"A few of the advantages of the consolidated school may be listed as follows: (1) Increased school enrollment and better attendance; (2) fewer absences and tardinesses; (3) pupils arrive at school dry and warm; (4) pupils are usually under supervision on the way; (5) larger classes and better grading; (6) fewer classes to the teacher, longer recitation periods possible; (7) opportunity for introducing vocational courses; (8) better physical equipment; (9) longer terms; (10) better teachers; (11) closer supervision; (12) community-centre work made possible; (13) recreational opportunities afforded; (14) eliminates many school officers; (15) fosters good roads movement; (16) less waste; (17) awakens community pride; (18) makes community high school possible. The disadvantages of such schools, often urged, are: (1) Depreciation of the value of property where schools are abandoned; (2) children have to attend school farther from home; (3) long rides to and from school for some pupils and long walks for others; (4) bad associations on the way often result; (5) local jealousy aroused; (6) more expense; (7) removes old landmarks; (8) bad roads often cause irregularity in attendance.

"When we come to look into these advantages and disadvantages, we see that, where physical barriers, such as too great distances, mountain ranges, impassable roads, or large bodies of water, do not intervene, there are but few effective arguments against consolidation."

Origin of the consolidation movement. The consolidation movement began in Concord Township, Massachusetts, in 1869, when a law was passed providing for transportation, and then 2 districts were consolidated. Within 10 years all Concord Township had consolidated, and the movement had begun to spread. During the year 1912–1913, Massachusetts spent more than a third of a million dollars on the transportation of its school-children. The same year, Minnesota consolidated 60 districts; for the system spread from New England to the Middle West and thence to the South and the Far West.

The movement has become of national importance only during the last 14 years, in which time more schools consolidated than during the 48 preceding years. It has been successful in all parts of our country, even where severe winters, spring freshets, rugged hills, large farms, and wide plains or prairies might have seemed to make it impracticable; for free transportation under comfortable conditions is necessary to the success of the system.

Method of consolidating. There are 3 ways in which consolidation may take place. One of these, and the most usual, is *by permissive legislation*, which allows districts to consolidate and provide transportation when they cast a majority vote to do so. Formerly, each district voted separately; but of late, in many states, the districts have voted together as units. The second method is *by compulsory legislation*, which requires consolidation of schools whose daily attendance falls below a

Fig. 236. An Idaho consolidated school in a thriving agricultural district of 36 square miles, with an enrollment of 726 including 100 high school pupils. Eight wagons transport some 200 children, all those outside the city limits being carried free. There is a 2-acre playground and a 4-acre farm that is used to supplement the indoor class work in agriculture.

FIG. 237. The conveying of children by wagon to the consolidated school has been both praised and blamed. Under favorable circumstances, it is undoubtedly an advantage.

certain average. Indiana has taken the lead in this direction, requiring the consolidation of schools with fewer than 13 pupils. The third method is *by state aid*, each consolidated school receiving annual support according to its size and teaching force. The state may also provide funds for buildings, if they attain certain standards. Minnesota and Iowa have been pioneers in this system, under which their graded schools have increased rapidly.

It has been said that consolidation is actually a cheaper way of educating children than the maintenance of many poorly attended one-room schools. The fact seems to be, however, that the consolidated school costs more per pupil, but, possibly, less per day, in view of the long term, than the district or township group of the six-month or four-month type of school. The interest on the investment—that is, the number of efficient citizens who are returned to the farm—is probably 100 per cent greater from the central schools.

Introduction of agriculture, as a study. Among the many advantages of the consolidated schools are the better health conditions, the well-trained teachers, the varieties of studies, all made alive and interesting by being brought into relation with daily life and with the laboratories and workshops. Greatest of all, though, is the introduction of practical agriculture into the course of study, under instructors thoroughly prepared for the work. This study has come down into the elementary schools from the institutions of higher learning. It began with the land-grant colleges in 1862, later reached the high schools, and, finally, in 1897, entered elementary education under the Nixon law of New York, whose administrator was the Agricultural College of Cornell University. Through visits to the schools, lectures, institutes, the distribution of leaflets, and the organization of boys' and girls' clubs, the work was carried on under the direction of the Nature Study Bureau. Personal correspondence had a large and useful part in this pioneer work. At first, the lack of specially trained teachers for the schools stood in the way of the establishment of agricultural courses. This need gave birth, however, to training classes in these branches at normal schools and agricultural colleges and to summer short courses. To-day nearly all the agricultural colleges are working with elementary and secondary schools in agricultural instruction for teachers and in direct work among the pupils, and the normal schools of almost all our states teach farming to the girls who are to be instructors in country schools.

A phase of the consolidation question which is frequently overlooked is the rather marvelous growth of state graded schools. Wisconsin, for instance, has about 600 of these institutions, employing about 1,450 teachers, scattered over the state. About half of them are doing some work beyond the eighth grade. Each of the schools really becomes an educational center which, in many cases, is equivalent to a consolidation center.

Intermediate agricultural schools. The deputy commissioner of education for the same state points out that, as a result of this movement in the consolidation of one-room schools, several schools have been organized which will do the usual work of the 8 grades in the elementary course and 2 years of high-school work. He says: "These schools are generally known as 'intermediate agricultural schools.' The courses of study are along the lines of agriculture for boys, and of domestic science and home making for the girls. Teachers of agriculture have been employed in these schools on the understanding that they do continuation work during the summer. The boys who are taking the agricultural course are under the direction of this teacher, but are employed in regular farm work during the summer vacation."

Agriculture as nature study. Agriculture begins in the first grades as nature study. This is an effort to make the country interesting to the little children who live in it. It then advances to more practical farming. It seems to be a fact that, to most of us, what we see every day, what is associated with hard toil and the problems of making a living, does not present itself in a very attractive light. It has required, therefore, men and women of unusual imagination, leaders in country life, to show boys and girls the science and the poetry of the soil. To find these things, they are taken out into the garden, the orchard, the field, which they cultivate according to the instructions of the United States Department of Agriculture and the state agricultural colleges, and often under the supervision of county agents. Many schools have gardens and farms which the young people cultivate; and frequently the

community interest in the experiments is so great that neighboring farms are, to some extent, experiment, or demonstration, plots for the boys and girls. Seed testing, the examination of soils, grain and stock judging, the repairing of farm machinery, and dairy and poultry problems all become a part of the school course. While all the work is made as plain as can be, thought is given to the sciences beneath—to chemistry and biology, to mechanical and mathematical laws, physiology, and zoölogy. How learned these studies sound when they are dressed in their best names! Yet, when clad in their overalls and called merely "agriculture" and "manual training," some parents and a few educators fail to see in them what they are. Arithmetic means something to a farm child when it teaches him to estimate the quantity of corn in the crib, the shrinkage of pork in packing, or the amount of lumber needed for a chicken coop. It may be impossible for him to express himself in delightful English concerning the walls around Peking or the peoples of ancient Greece, when it is easy to write about butter fat and profits and losses in milk, if he has been working with a Babcock tester at school. The difference is that he does not care about Peking and Greece and has no impulse to talk about them, whereas he really wants to tell of his experience with his father's herd. The one is hack work, the other may be inspiration. It is no less an exercise in English, because the child knows what he is writing about.

Courses in agriculture and domestic science will make the rural schools real community centres; for in the new rural school parents, children, and teachers join in working out the problems of the farm and the home.

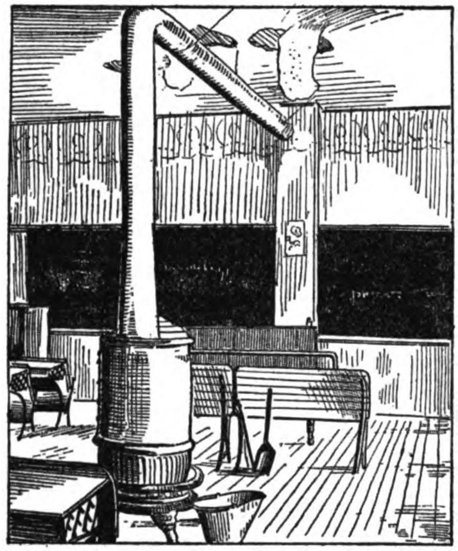


FIG. 238. The interior of a Missouri country school as a wave of progress found it. Note the falling ceiling and the dangerous, inefficient, inconveniently placed stove.

The Future of the District School

The little district school, however, may become a powerful force for the new education and the new community life. Its doing so depends upon a good teacher and his or her power to organize and inspire the neighborhood and to make the school mean what it should mean to the farming community in which it is located. Scattered all over the country are examples of one-room and two-room district schools from which boys and girls have gone to win prizes on their exhibits at state and county fairs. This is indeed fortunate, for during many years to come the district school will remain the institution in which a very large percentage of farm children will receive all the education they get.

County school leaders. County superintendents and their assistants are doing more and more efficient work as their field is limited to fewer tasks and as the position is removed from politics. In many counties, it is possible for superintendents to visit all the schools every few weeks and thus to give the district teachers needed support and advice. In some states, particularly those of the South, certain supervisors are assigned to oversee special courses, such as agriculture, manual training, and domestic science.

A premium for good work. In order to set up a standard for the district schools, a system of inspection has been established in some places by means of which schools are classified as "standard" or as "superior," according to their site, grounds, building, furnishing, heating, ventilation, lighting, sanitation, equipment, and teaching. A diploma is awarded the schools which earn it and over their doors is placed a plate, engraved with the word "stand-

ard" or "superior," according to the work done. The effect of this standardization, or grading, which takes many forms, has been to increase greatly the number of one-room schools that are doing good work. The supporters and patrons are also given clearer ideas as to the kind of school they should provide for their children.

AGRICULTURAL EDUCATION IN HIGH SCHOOLS

By A. W. NOLAN, *State Supervisor of Agricultural Education for Illinois, and Assistant Professor of Agricultural Extension in the College of Agriculture of the University of Illinois. He was born and gained experience until 24 years of age on a farm, with which he renewed active connections in 1912. He graduated from Indiana University, taught in rural schools and was principal of a township high school, professor of horticulture in the West Virginia Agricultural College, and professor of agricultural education in Chicago University before taking his present position. Fortunately for country boys and girls, for the farms from which they come, and for the country in general, more and more of them are reaching out for the advantages offered by the high school. This improvement over former conditions has come about partly because of the new and increased appreciation of the worth of education, and partly because of the splendid advances made by the schools in preparing themselves to supply the needs of the country child.*—EDITOR.

THERE is no longer any question as to whether or not agriculture should be taught in the rural schools. Sentiment and public opinion demand it, and in many states the law requires it. There are, however, still a few farmers who object to the teaching of agriculture to their children; but most parents favor a study of the vocation which supplies their means of living. The subject is vital to the life of every member of the farm family. Upon the soil, among the plants and animals, and in the open country they live and move and have their being. In its broadest sense and fullest possibilities, agriculture includes everything which enables us to teach in terms of the lives of the people and the needs of the community.

Through the teaching of agriculture in the schools there is afforded an opportunity to break away from the four walls and the bookish, impractical systems and to learn in a natural way from the real things of nature and life. Even though the district-school teacher be a woman, and not especially trained in agriculture, if her heart is right and if she is willing to learn with the pupils, a beginning in agricultural instruction can be made.

Agriculture in district schools. Before discussing the subject of agricultural education in high schools, it may be worth while to glance at what is being done in the elementary schools to prepare a foundation for the high-school course.

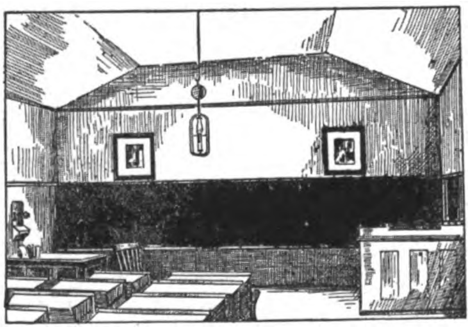


FIG. 239. The school shown in Fig. 238, one year later. A furnace has replaced the stove, the interior has been tastefully redecorated, and the desk equipment and arrangement have been greatly improved.

Agriculture, which practically begins in the early grades as nature study, is introduced into the seventh and eighth grades, and is taught in the district schools throughout the country in various kinds of courses and through widely varying methods. The most common way and the one fitting most easily into the present system is the textbook method. Each pupil has a book on general agriculture; lessons are assigned and studied; and recitations are given as in the case of geography, physiology, or any other common branch of study. An occasional field trip, demonstration, or laboratory exercise may vary the class work in agriculture. As far as this work results in the teaching of correct scientific principles which may be applied in practical vocational agriculture, it is well and good. A knowledge of principles and good farm practices, even though the pupil may

have no opportunity to carry them out at the time, is a necessary part of good practical agriculture. Dean Davenport, of the College of Agriculture of the University of Illinois, takes the point of view that if the pupil is led to a genuine interest in agriculture and in the things and affairs of the farm, even though no practical vocational work is attempted, he has made a good start in agriculture as a vocation and will make a better citizen, even if he should choose another life work.

The home-project method. Another method, coming into successful use in many states, is known as the "home-project method." In Bulletin No. 385 of the United States Department of Agriculture this method is described as follows: "The term 'home project' applied to instruction in elementary and secondary agriculture, includes each of the following requisites: (1) There must be a plan for work at home covering a season or a more or less extended period of time; (2) it must be a part of the instruction in agriculture of the school; (3) there must be a problem more or less new to the pupil; (4) the parents and pupil should agree with the teacher upon the plan; (5) some competent person must supervise the home work; (6) detailed records of time, method, cost, and income must be honestly kept; and (7) a written report, based on the record, must be submitted to the teacher. This report may be in the form of a booklet."

Pupils of the school choose or are assigned to definite agricultural projects to be worked out at home, such as growing an acre of corn, caring for a vegetable garden, keeping a pen of poultry, or raising a litter of pigs. One or two projects are carried out each year by each pupil, and the school agricultural work may be based upon the home projects. By this method it is not necessary to have many formal class-room recitations. The teacher and parents direct, encourage, and instruct the boys and girls in their work, reading, and study along the lines of the project. The boys and girls carrying out the projects may organize into a club and become affiliated with the state boys' and girls' club movement.

Elementary agriculture in the district schools is coming to have 2 main aims: (1) to teach the elementary facts of scientific agriculture and good farm practice, arousing interest in this great vocation; and (2), through home projects, to offer to the boys and girls an opportunity to do practical scientific farming on a small scale, thus contributing something to the production and conservation of the world's food supply as well as to their own educational development.

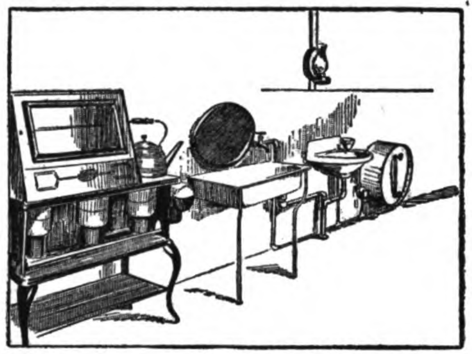


FIG. 240. The basement of the same school after two years. In addition to the furnace, it boasts a water pressure tank (*in background*), a sanitary drinking fountain, a sink, running water, and an oil stove on which the children's hot lunches are prepared and lessons in cooking are given.

When we know that the vast majority of country boys and girls never go beyond the seventh and eighth grades of the elementary school, it follows that whatever is to be done in the way of laying the foundations of agricultural knowledge in a systematic manner for the great body of pupils must be accomplished before the pupils leave the elementary schools.

There are undoubtedly very difficult practical problems in teaching agriculture in the district schools. The teacher has a great deal to do. She must conduct many recitations each day. Additional subjects, therefore, may find little welcome. In spite of these difficulties, however, hundreds of teachers in elementary schools have blazed the way, pioneered through handicaps, and found, in the success accompanying their efforts, that they have vitalized their schools, benefitted their communities, enriched the lives of their pupils, and brought success and greater satisfaction into their own lives and work.

Agriculture in the consolidated school. The subject matter and methods in elementary agriculture are pretty much the same in consolidated schools as in the district schools, except that more time is given to field, laboratory, and class-room work in the consolidated school than is possible in the rural school. Then, too, better prepared teachers handle the work. The home-project work also takes on more interest and admits of closer supervision and further development. The consolidated school, becoming a social center, may provide short agricultural courses and continuation schools for extension service to the people of the community. The greatest value, perhaps, of the consolidated school is that it becomes the basis upon which to build a good 4-year high school in which the vocational courses may be well organized and taught.

Agriculture in the high school. According to a report of a committee of the Association of American Agricultural Colleges, made in 1916, agriculture was then being taught in 4,660 high schools in the United States. This is about 40 per cent of all the high schools of the country. Over 90 per cent of these schools have introduced agriculture within 10 years; and the number is likely to increase rapidly, especially since the passage of the Smith-Hughes Bill, providing federal aid for the teaching of agriculture in the high schools of the United States.

The American high school has rightly been called the people's college; because of the institutions offering higher education it is the nearest to the masses of the people. Nothing in the history of education is more phenomenal than the growth of the high school; and with this growth, especially in the case of the community high school, has come the introduction of vocational studies. This is well, since the ideal of universal education demands a school where opportunities may be offered to all the people to enter into the educational heritage of society at its best, and into the major vocations trained for success.

Practical scientific agricultural education for the largest number of farm folks is more successfully obtained through the modern district or community high school than through the district elementary school or through the state college of agriculture. The district elementary school is nearer the farms, but the organization of the school and the preparation of the teacher will not permit work of much vocational value being done. The state college of agriculture is well equipped to give agricultural education, but not all farm folks can go to college. On the other hand, the high school, wherever established, is within reach of a very large percentage of farm boys and girls. When equipped and manned to give vocational work in agriculture, it is of real practical value.

Courses of study. A common outline of courses of study in agriculture, as offered in high schools, is the following: First year, plant industry (first semester, farm crops and soils; second semester, horticulture); second year, animal husbandry (both semesters); third year, the farm physical plant (both semesters); fourth year, special electives (one semester each): (1) improvement of plants and animals; (2) soil; (3) dairying; (4) poultry; (5) vegetable gardening; (6) farm accounting; (7) farm management.

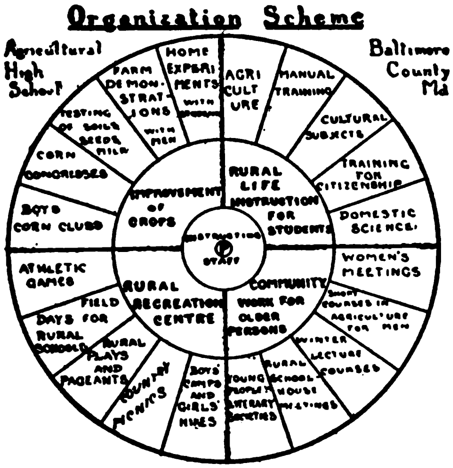


FIG. 241. Plan of a campaign for the development of a rural school, showing scope and relationship of the various agencies which can affect and be affected by its work, both within its immediate circle, and throughout its community. ("Journal of Agriculture," Univ. of Cal.)

There are several good textbooks to assist pupils and teachers in their agricultural courses. Although high-school agriculture should break away from the book for the farm, orchard, barns, and gardens of the open country, it is necessary that a text be in the hands of the pupils to give definiteness to the course. The aim of agriculture in the high school should be to contribute to the liberal education of the student as well as to his vocational efficiency. In this aim is implied the belief that its realization will satisfy society's needs and aims quite as well as the individual's. All surveys of agricultural conditions show: (a) Soil fertility not generally conserved; (b) livestock production decreasing; (c) grain production not keeping pace with the increase in population; (d) purebred stock not generally owned; (e) market facilities not adequate; (f) farm machinery deteriorating; (g) orchards neglected; (h) forests devastated; (i) labor scarce and inadequate; (j) increase of tenancy; (k) insect control poor; (l) acre income low;

(m) great waste; (n) poor organization and coöperation; (o) rural exodus.

The principles and practices of scientific agriculture apply directly to the improvement of all of the above conditions. Agriculture in the high school should contribute very substantially to the attainment of: (a) a greater degree of permanency in soil fertility; (b) increase of grain and livestock production; (c) better livestock and food plants; (d) greater control of insects and fungous diseases; (e) better roads; (f) rural organizations and coöperations; (g) conservation of forests; (h) better use and care of machinery; (i) better market facilities; (j) the retention of a larger share of the surplus profits by the farmer; (k) better living conditions in every respect.

There has been a great deal of discussion as to whether agriculture, along with other industrial subjects, should be given in the high schools already existing, or whether special schools are needed for these subjects. Those advocating the former plan contend that it is wiser to join agricultural instruction with the work now being done, and to make it a part of the educational system already established. The advocates of the special agricultural high school believe that better courses than those usually offered in the regular high schools can be worked out for these special schools, courses containing all that is essential in the old ones and, in addition, providing for training along distinctly agricultural lines.

There are many examples to show that agricultural education can be effectively given in the existing high schools. On the other hand, there are many special schools of agriculture of a secondary nature that have succeeded and served well. These schools, of whichever kind they may be, are already great channels through which the achievements of society at its best are brought to the people of the open country.

State and county agricultural high schools. In 1916, there were in the United States 85 special state schools of agriculture of secondary grade for white persons. In about 20 cases, these secondary schools were maintained by the state college, and had the advantage of the college grounds and instructors. County agricultural high schools seem to be the most favored of the special type. Such schools were first established in Wisconsin in 1902. These schools are agricultural trade schools. They are designed for boys and girls who are unable to attend college courses, but who desire to obtain a practical training for the farm in their high-school course. The county is the taxable unit, and the school draws its support from both the county and the state.

The congressional district schools of Alabama and Georgia represent another type of special schools giving agricultural education. Each school embraces from 2 to 9 counties, and is supported both by the district and by the state. These schools are designed to be vocational, and they emphasize the financial aspects of their instruction. The school farms belonging to them are run on a strictly business basis, unless reserved for demonstration purposes.

Private schools giving secondary agriculture. In many church and private business and technical schools, courses in secondary agriculture are being offered. During the present century, there have been established several private schools in which secondary agriculture and domestic science are the leading features. At Briar Cliff Manor, New York, and at other places near that city, schools for the training of city young men and women in agriculture have been established. Private schools established near other large cities and giving instruction in agriculture show the demand for this type of education. The Glenwood School for Boys, near Chicago; the National Farm School, near Doylestown, Pennsylvania; the Baron de Hirsch Agricultural School, Woodbine, New Jersey, the Mount Hermon School, near Northfield, Massachusetts, and the Wenona Agricultural School, near Warsaw, Indiana, are notable examples of these types of schools. The agricultural work done in them is usually of a high class. Land and equipment are available; the schools are on the farms; and the students get first-hand, practical work in the best type of farm operations, as well as a thorough study of the principles of scientific agriculture.

Normal schools. In many normal schools, courses in elementary agriculture are given to prospective teachers. State courses of study are requiring

more and more the teaching of nature study and agriculture in the elementary schools; and the normal schools owe it to the rural communities as well as to the cities to teach not only these subjects, but also the methods of teaching them in the elementary schools. Several normal schools maintain departments of agricultural education, and courses like the following are given to prospective teachers: Nature study, elementary agriculture, school gardens, soils and crops, farm animals, dairy industry, poultry husbandry, horticulture on the farm, the farm home, rural sociology, and the rural school.

Upon the high schools and the county and state normal schools we must depend for the training of elementary teachers; and upon these teachers, probably more than upon any other class, will depend the attitude of the country boy and girl toward agriculture.

HIGHER EDUCATION IN AGRICULTURE

By MRS. HELEN JOHNSON KEYES *and* PROFESSOR A. W. NOLAN. *The college course in agriculture is no longer regarded as merely a preparatory step toward a lifetime of laboratory research and scientific teaching; practical farmers are finding it an invaluable aid to greater efficiency and profit making, not only because of its educational effects, but also because of its broadening tendencies and opportunities. Consequently they are sending their sons and daughters for two-, four-, and even six-year periods, and in many cases are attending, themselves, the short winter courses in which the essence of the principles of different branches of farming is offered to those who can spare only a short time from their home activities. The results are everywhere to be seen, justifying in every way the claims and expectations of the pioneers who blazed the educational trail through a hostile wilderness of doubt, ignorance, and shortsightedness. It is especially significant that, although each of the states now has its agricultural college, there are also a good many institutions of collegiate grade which, realizing its importance, have of their own accord added agriculture to their program of major subjects.*—EDITOR.

LAND-GRANT colleges and experiment stations. Agricultural education in the United States had its real beginning in 1862, when President Lincoln approved the Morrill Act providing for the establishment of land-grant colleges. The act was vague. It provided for the support of at least one college in each state where branches of learning relating to agriculture and the mechanical arts should be taught, in addition to the usual studies and military tactics. For this purpose 30,000 acres were given to each state for each member it sent to Congress.

By the Hatch Act of 1887, $15,000 was given annually to each state for agricultural experiment stations and research; and in 1888 the Office of Experiment Stations was established in Washington as a bureau within the Bureau of Agriculture (created in 1862) as a clearing house for the state experiment stations. This act brought into being 26 new experiment stations, making a total of 46.

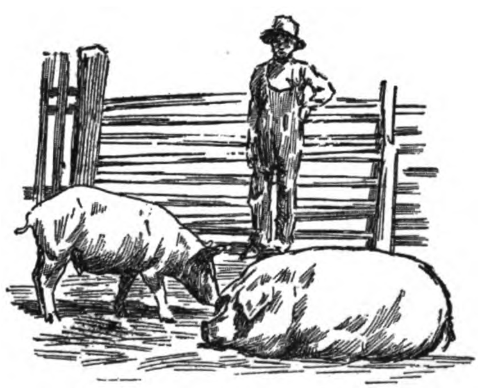


FIG. 242. These hogs are litter mates. That on the left was raised by a practical farmer; that on the right by his son, a member of a pig club. This suggests what enthusiasm and rightly applied instruction can do.

The second Morrill Act, approved by President Harrison in 1890, provided an endowment for each state of $15,000 the first year, to be increased $1,000 each year till the annual sum of $25,000 for each state was reached. These funds may be applied "only to instruction in agriculture, the mechanical arts, the English language, and the

various branches of mathematical, physical, natural, and economic sciences, with special reference to their application in the industries of life."

The Adams Act of 1906 provided for the further encouragement of agriculture by granting to each state experiment station $5,000 the first year, with an increase of $2,000 annually up to $30,000. When these bequests are complete, the United States will be devoting $1,500,000 annually for experiment-station work. As the individual states are already giving more than this, some idea may be formed of the importance to the nation of an efficient agriculture and a high type of farm citizenship.

The intention of Morrill in providing for the land-grant colleges was not so purely agricultural as would be indicated by their later development. His idea was not chiefly to encourage agriculture, but to supply opportunities for a practical education which classical colleges do not give. He himself states that the name "agricultural colleges" originated with an index clerk, who found that heading a convenient one for his records of the institutions in question. Ezra Cornell's definition is contained in the expression of his desire to "found an institution where any person can find instruction in any study."

Purpose of the land-grant colleges. In the Morrill Bill of 1862, the purposes of the land-grant colleges were expressed in broad terms as follows: "To the endowment, support, and maintenance of at least one college, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts in such manner as the legislatures of the states may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." The ultimate purpose of the land-grant colleges was not to uphold scholarship, but to create skilled industrial workers out of the material at hand. When the colleges opened, industrial education had not filtered through into the secondary and primary schools. The high schools were very little used by the farming or industrial classes; indeed, the majority of country boys and girls left school altogether at the fifth or sixth grade. It was from this material that the land-grant colleges recruited their students. Had they held to high entrance examinations or high-school certificates, they would have perished for lack of pupils. Now that practical sciences have become a part of the curriculum of most rural and secondary schools, these schools hold and graduate the type of boys and girls who later enter the agricultural colleges; and this changed condition is making it possible for many of the colleges to demand high-school certificates as an entrance requirement.

The charge has been made that agricultural colleges tend to educate boys away from the farms, instead of returning more efficient workers to the home acres. It must be remembered, however, that these college graduates, although they have not always returned in large numbers to till the ground, have returned to the farm as educators, agents, and organizers of rural life. When they have performed their good work as leaders, they may, perhaps, have made the farm a place to which other graduates will be glad to go back as practical farmers.

Altogether, the agricultural colleges have had a task to perform different from that which has confronted any other educational institution. They have had to create a suitable type of man and woman for the work they offered. This they have done through their graduates. They have had to think out a body of scientific knowledge from the loose medley of facts and practices which characterized farming before their labors began. They have also had to overcome the distrust of farmers and, sometimes, the scorn of educators.

Courses of study. The curriculum is tending to divide itself sharply into 3 courses. One of these is a 4-year collegiate course with a good standard of general scholarship. There are, also, courses of from 3 months to 2 years for boys whose homes cannot spare them longer, and for which the preparatory work has not necessarily included high school. These short terms are needed also by graduates of agricultural high schools, to whom they give a valuable opportunity for association with agricultural experts and for the use of laboratories and all the equipment for research. The farmer himself, who can leave his fields only during brief periods, finds such courses highly profitable. Into them is packed much information which can be applied day by day in the work at home. Many colleges are now dividing the school year into quarters, and this plan is proving of great benefit to boys who are needed on the farms during the busy seasons.

At the top of the college there is a demand for a school for graduate students. The work

FIG. 243. A "Better Stock" agricultural extension train. Every year sees increased development of the idea of taking education out to those who are unable to go to schools and colleges in search of it.

of these men of superior training should give birth to many new ideas and movements in agricultural life.

Work of the agricultural colleges. Agriculture is destined to play a large part in the future of general education. In such movements for agricultural education, the agricultural colleges obviously ought to exercise wise and influential leadership.

The purposes of the agricultural college are: (1) to give technical training in scientific agriculture and general liberal education to students in attendance; (2) to investigate unsolved problems; and (3) to extend the services of the college to the people of the state outside the college. A recent bulletin issued by the University of Illinois states: "The Agricultural College and Experiment Station were established for the advancement of farming and housekeeping and the improvement of living conditions in the open country."

An agricultural college, supported in part by Federal appropriation and in part by the state, has now been organized in every state in the United States. Some of these, as Purdue University, Indiana, are separate agricultural colleges, and others are organized as colleges in the state university, as those of Illinois and Wisconsin.

All of these colleges have had a hard fight for existence and recognition. They have had to train their own professors, to create a body of knowledge and give it pedagogic form, to break down the distrust of the practical farmer, and to secure the sympathy of sometimes hostile educators. In spite of these difficulties, they have become established on a firm foundation and have justified their creation.

The colleges of agriculture have made large contributions to the farming industry and to farm life, and have thus benefited all the citizens of the state. Agricultural colleges are nearly always managed, and the funds, both Federal and state, spent, by boards of trustees appointed or elected wholly by the state. The unit of organization and work is usually the department. The college president, or dean, is the chief officer of power and control; and at the head of each department is a strong man as chief, under whom are groups of specialists and their assistants.

The financial needs of the agricultural colleges are met by direct special legislative appropriations in the state and by such fixed annual Federal incomes as those provided by the Morrill, Hatch, and Adams funds. The states often provide a continuing tax, usually called a "mill tax," providing a fixed financial policy. The growth and needs of the colleges, however, are likely to develop faster than the funds which such taxes provide. The Federal funds for both college and station work in the leading agricultural states vary from $100,000 to about $400,000. The states have added to these funds, in some instances, sums reaching nearly $1,000,000.

Methods of teaching. The most important forms of instruction given in agricultural colleges are: (1) graduate teaching for advanced students who have finished a 4-year course, and who desire further specialization leading to the master's degree in 1 year, and the doctor's degree in 3 years; (2) the regular 4-year course, requiring graduation from an accredited high school for entrance, and leading to the bachelor's degree; (3) the short course, varying from 2 weeks to 2 years, giving special practical instruction to mature men, who either are already farming or will soon enter the business; and (4) the extension-teaching service consisting of movable schools, institutes, correspondence courses, lecture courses, etc., designed for those who do not attend the college, but who desire some of the instruction and other assistance which the college can give.

The major subjects of instruction in the agricultural colleges relating directly to vocational agriculture are soils, farm crops, farm mechanics, farm management, animal husbandry, dairy husbandry, horticulture, landscape gardening, floriculture, household science, agricultural extension and education. Non-agricultural subjects, such as English, foreign languages, history, mathematics, the pure sciences, economics, education, music, physical training, etc., usually make up a small fraction over one half of the college course. Three principal methods are followed in modern college and high-school teaching. These are: (1) the use of textbooks with classroom recitation; (2) the lecture, with occasional oral quizzes and written tests; and (3) laboratory and field work of various kinds.

As the colleges are now organized, there is little opportunity for the student to get any large amount of first-hand practical work in farm operations. He has the opportunity, however, to see and learn the best methods of farming as carried out on the college farms. The encampment method, through the summer months, whereby students under instruction get practical experience in forest, field, or orchard, or on livestock farms, is a promising improvement in instructional methods in agricultural colleges.

What the colleges and stations have done. The value of the work of the American agricultural colleges can scarcely be overestimated. Hundreds of thousands of young men and women have gone out from them and become leaders in the campaign for the conservation of the agricultural and human resources of the country. They have established modern homes, farmed the land scientifically, and raised the standards of life in rural communities. While living in the country, and laboring with their own hands, these young men and women have gathered about themselves the best things of civilization.

The colleges and experiment stations have also brought before the public, and shown the applicable values of many new discoveries such as soil surveys with definite recommendations for soil improvement, improved breeds and strains of animals and plants, control of insect pests and fungous diseases, best methods in the nutrition of plants and animals, principles of economic farm management, and better methods of marketing. Patient, capable, hard-working, scientific-research men are constantly at work in these institutions, not in the spirit of meddling with the farmer's business or showing him how to farm, but aiming to discover new facts and practical principles which the farmer may, if he so desires, use in his business for its improvement. Through its extension service the college of agriculture has broken from traditional academic subject matters and methods, and gone out from the classrooms, laboratories, and plots to give and to receive the benefits of the successful achievements of scientific agriculture. Agricultural extension service, on the one hand, has quickened the agricultural college and increased its financial support and student attendance; and, on the other hand, it has brought the benefits of scientific agriculture to the farms of the people in every community of the country.

EXTENSION TEACHING IN AGRICULTURE

By MRS. H. J. KEYES *and* PROFESSOR A. W. NOLAN. *The isolation of the farmer and his family was for a long time the greatest obstacle in the path of his getting or giving his children an adequate education. The combination of time, effort, and expense required to attend anything more than the district school, put learning out of the reach of all but a few who were unusually favored. Then, at last, came the idea of taking education out into the country to those unable to get to its sources. It took root, it grew—slowly, perhaps, but steadily—and under the guidance of tireless, farsighted, enthusiastic extension workers, it spread, developed, diversified and finally became one of the most far-reaching and effective of all educational movements. In some form or phase it is already familiar to most farmers throughout the country; but in its entirety as discussed here, it may give a good many of them new food for thought, and a better idea of what has been and is being done to make farming the business and life it should be.*—EDITOR.

EXTENSION work in agriculture has been defined as "that phase of instruction which is carried on among people who are not resident students at an educational institution." It aims to make the truths already discovered available to those farmers who are actually in the field. Furthermore, it has to do not only with improved methods of agricultural production, but with the general welfare of the rural population.

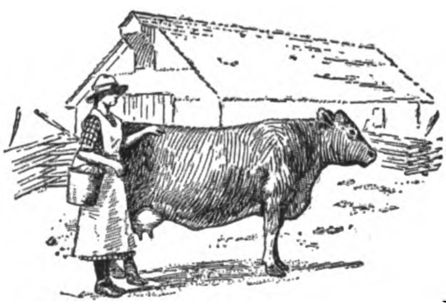


FIG. 244. Proprietorship and competition are two of the main reasons for the splendid success of the club work idea. This shows a member of a cow club, and the cow that is hers to care for or neglect, to succeed or to fail with.

Scope of extension work. The scope of extension work may be briefly set forth in the following outline, adopted by the Committee

FIG. 245. Members of a garden and canning club making up and packing an exhibit for a local fair. In times of food shortage, more gardens mean less hardship and better health, as well as more capable farm boys and girls.

on Extension Work of American Agricultural Colleges and Experiment Stations:

A. Definite systematic instruction, or formal teaching.
   1. The lecture course, given under the auspices of various clubs and organizations, one night a week for several weeks.
   2. The reading course, drawn up by college and state department of education.
   3. The correspondence course, subjects prescribed and questions set by the college. Answers are sent to the college and returned to the student when corrected.
   4. The movable school, lasting from a week to a month. Instructors are sent from the college; regular lectures and class demonstrations are given as in any school; but the school is itinerant in character.
   5. Permanent demonstration plots or farms. The value of certain methods of soil treatment and the cultivation of varieties of crops are demonstrated right at the door of the farmer.
   6. Club work of various kinds, such as boys' and girls' corn clubs, canning clubs, poultry clubs, and the like.

B. Teaching that is more or less informal, advisory, or suggestive.
   1. Conventions.
      (a) Farmers' institutes. These are conducted by the college in many states. Where they are not conducted by the college, they generally look to the college for assistance.
      (b) Conferences on special topics, such as dairying, poultry raising, fruit growing, and the like.
      (c) Short courses for agricultural instruction.
   2. Itinerant lectures.
      (a) Miscellaneous lectures on call and under many auspices.
      (b) Traveling advisers or field agents.
      (c) The permanently located expert or adviser for a county or other prescribed district.
   3. Literature.
      (a) Publications: monographs, leaflets, circulars, bulletins, etc.
      (b) Correspondence.
      (c) Traveling libraries.
   4. Object lessons.
      (a) Field and platform demonstrations, such as spraying demonstrations, etc.
      (b) Educational exhibits at fairs, stock judging, corn testing, and the like.
      (c) Excursions to the college, to study experiments or to see demonstrations.
      (d) Special trains, railroad cars, or trucks carrying agricultural material for educational purposes.

C. Coördination and coöperation.
   1. Holding "Conference on Rural Progress," to bring together all the people interested in rural life for the discussion of the larger problems of rural betterment.
   2. Coöperation with other agencies and activities, such as chambers of commerce, boards of trade, manufacturers' associations, labor organizations, and the like.

All these are, or should be, educational enterprises designed to reach and benefit every man, woman, and child in every farm community. With the expansion of agricultural education in the high schools, many of these extension activities will be found feasible there. Agricultural instructors in the high schools are becoming wide awake to their opportunities for coöperating with the colleges in bringing to their community the combined services of the high school and the college. At this time, though, we are most directly concerned with the development of the work through the United States Department of Agriculture and the state agricultural colleges.

The Smith-Lever Extension Act. The Smith-Lever Extension Act (1914) provides for a permanent nation-wide system of agricultural extension work to be carried on by the state agricultural colleges in coöperation with the United States Department of Agriculture. This extension work includes practical instruction and demonstration in agriculture and home economics and the imparting of information through field demonstrations, publications, and other means, as mutually agreed upon by the secretary of agriculture and the state agricultural colleges.

Under this act, one agricultural college in each state is selected, with the understanding that this college must maintain a division exclusively devoted to extension work in agriculture and home economics. This department is in charge of a director selected by the college, with the approval of the United States Department of Agriculture. The director must submit detailed projects covering each line of extension work, and these must be approved by the Department before the work is undertaken. Under this director, generally there are men in charge of various lines of work. In all states, one state leader has charge of county-agent work and boys' and girls' club work, the agents in charge of club work being subordinate to him; in each of the thirty-three northern and western states, there is a separate state leader for the club work.

Funds available. The Smith-Lever Agricultural Extension Act provided that each state should receive $10,000 annually for coöperative extension work in agriculture and home economics, making a total of $480,000 per annum, beginning with the fiscal year 1914–15. For the fiscal year 1915–16 it provided for $600,000 additional to be distributed among the several states in the proportion that the rural population of each state bore to the total population of all the states, as determined by the last census. This amount is to be increased by $500,000 each year until the fiscal year 1922–23, when the total amount reaches $4,580,000. This additional appropriation does not become available to a state until an equal amount has been appropriated by the legislature of that state or has been provided by state, county, college, local, or individual contributions from within the state. The aggregate sums thus required to be provided by the states for the fiscal year 1922–23, and annually thereafter, will be $4,100,000.

The funds are to be used only for the instruction of persons not resident in or attending any of the designated colleges. None of it may be used for the purchase or repair of buildings or the rental of land; nor may more than 5 per cent be applied to the printing or distribution of printed matter. Its agent is the teacher, and its classroom and laboratory the farm.

In addition to the money directly appropriated to offset Federal Smith-Lever funds and available under the provisions of the Smith-Lever Act, considerable sums have been contributed from various sources within the states. The total amount in 1916–17 was $6,103,000, derived from the following sources: $943,000 from the farmers' coöperative demonstration funds, $120,000 from other bureaus and offices of the department, $1,580,000 from Federal Smith-Lever funds, and $1,100,000 from state Smith-Lever funds. Approximately, $600,000 was appropriated by the state legislatures in addition to the money put up as an offset, $1,250,000 from county funds, $140,000 from college funds, and $370,000 from other miscellaneous sources.

How the money is spent. The allotment of funds from all sources for coöperative agricultural extension work for the year ending June 30, 1917, by projects, was as follows: Administration, $445,720; publications, $137,187; county agents, $3,102,893; home economics, $756,050; extension schools and boys' and girls' club work, $565,309; animal husbandry, $126,815; poultry, $44,684; dairying, $173,871; animal diseases, $23,345; agronomy, $125,380; horticulture, $82,490; botany and plant pathology, $35,139; entomology, apiculture, and ornithology, $13,485; forestry, $3,700; agricultural engineering, $52,281; farm management, $97,155; rural organization, $34,082; marketing, $35,356; exhibits and fairs, $7,775; farmers' institutes, $72,420; correspondence courses, $38,713; agriculture in schools, $15,256; miscellaneous, $113,429; total, $6,102,765.

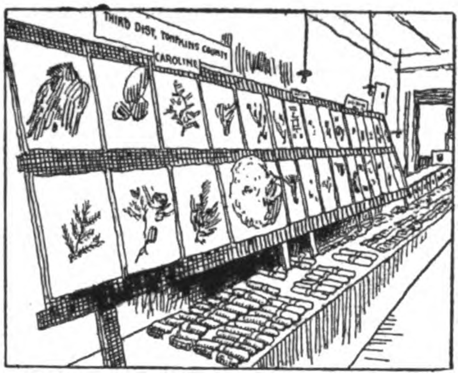


FIG. 246. Competition among schools at fairs and expositions develops healthful rivalry and local pride and puts a premium on teamwork and coöperation among the pupils of each competing institution.

County agents. It will be seen that by far the largest amount in the foregoing expenditures went for county-agent work. The county agent is the joint representative of the local community, the state (through its agricultural college), and the nation (through its department of agriculture). The county-agent work really grew out of the farm demonstrations conducted under the direction of agents covering a large territory. About the year 1906, many counties began to contribute to the salary of the agents of the department; and in this way the work became more intensive, being in many cases confined to a single county. Prior to the year 1912, almost all of the extension work in this territory was carried on in the southern states. However, a few states farther north had joined in the movement.

The great practical value of farmers' coöperative demonstration work, as conducted in the South, was shown after 1902, when the Mexican boll weevil appeared in central Texas and destroyed extensive crop areas. The Bureau of Plant Industry tried to convince the cotton growers that they could grow cotton despite the boll weevil, but most of them were not interested in anything except the destruction of the pest. Dr. Seaman A. Knapp, a representative of the United States Department of Agriculture, who was engaged in demonstration work in the South, then arranged with a successful farmer in each county to demonstrate the possibility of growing cotton according to the instructions of the Bureau of Plant Industry without exterminating the boll weevil. These farmers were called "demonstrators." Other farmers, known as "coöperators," were supplied with literature on the subject, were free to call upon the agent, and, in some cases, were occasionally visited by him, but not as frequently as were the demonstrators. The diversification of crops was also encouraged. The result upon the agricultural life of the South was most helpful. Louisiana, Texas, and Arkansas—the boll-weevil states—were not only able to grow cotton, but they engaged in a more diversified agriculture, including the growing of profitable crops of corn and vegetables and the raising of chickens, hogs, and cattle.

County agents are employed coöperatively by the county, the state agricultural college, and the United States Department of Agriculture, assisted in some cases by other coöperating parties. Details as to employment, in so far as the state is concerned, are not the same in all states. In Illinois, for instance, the farmers of any county may organize a farm bureau with a membership of 300 or more, each member paying a fee of from $5 to $10. They then employ a county agent, the government supplementing the fund, usually to the extent of $1,200. In Missouri, the county, the state, and the Federal Government each contributes one third toward the employment of a county agent. However, in one county in Missouri, 150 farmers clubbed together, in 1917, for the employment of a farm agent, whose salary of $5,600 per year they pay without county, state, or national aid. In the whole of the United States, nearly 1,300 male county agents are employed, and there are nearly 500 counties having women agents.

What the county agent does. One of the duties of the county agent is to bring to the farmers of his county on their own farms the results of scientific investigations in agriculture and the experience of successful farmers, and, through demonstrations, to induce the local farmers to put these into practice. In his organization work, he assists in reorganizing and redirecting the agriculture of the community, and aids all economic and social forces working for the improvement of agriculture and of country life. He gives instruction not only in those subjects which are generally recognized under the head of improved agricultural practices, but also in farm management, marketing, and the purchasing of supplies. In all this work he conducts a large number of demonstrations and gives out much valuable information. He works, as far as possible, with existing organizations, such as granges, farmers' unions, alliances, organized farmers' institutes, and community clubs; but he may also aid in forming new organizations especially suited to support his work.

In the South, great emphasis is laid upon community organizations of farmers. These are increasing rapidly, and involve work both among men and among women. The tendency and general policy of the work in most of the states in that territory is gradually to form central county organizations composed of representatives of the community organizations, to deal, in coöperation with the

county agents, with such problems as are county-wide in their nature.

In some of the northern and western states, county organizations, called "farm bureaus," have been developed to support the county agents in their work. The farm bureau may include in its membership any person who is interested in better farming. Its officers are generally selected annually. It has an executive committee, which has the responsibility of arranging for the selection and financing of the county agent; and its committees, both central and local, assist the county agent in carrying out the county program of work.

Boys' and Girls' Extension Work

(*By* O. H. BENSON, *of the U. S. Department of Agriculture, who has charge of the work in the thirty-three northern and western states.*)

Farming and home making constitute the two greatest factors back of America's industrial and business efficiency. Upon these two prime and important interests the U. S. Department of Agriculture, coöperating with the state colleges of agriculture, has established a type of popular education truly American in its ideals, as well as in methods of procedure. This promises much for a more efficient and contented rural people, and as a type of education contemplates the connecting of the work of schools, colleges, and universities with the everyday activities of farm and home.

The making of a real democracy requires more than the educating of the people who attend schools and universities. Through extension schools and by means of itinerant teachers information from classroom, laboratory, and experiment station, as well as from books, must be carried to others. This is accomplished by means of personal visits, field meetings, demonstrations, printed follow-up instructions, and by other methods which will give to every home the correct interpretation of useful knowledge and help average citizens everywhere to make of it common practice.

History of the movement. Boys' and Girls' Extension Work was first known in the Central States in connection with county and state industrial fairs. Some of the county superintendents of schools of Iowa, Illinois, Missouri, Indiana, and Ohio as early as 1896 conducted boys' and girls' contests and exhibits in the production and showing of farm animals and products. These activities were later developed into the garden and corn-growing contests. These early activities and the efforts by volunteer leaders met with considerable discouragement. Due to a lack of trained leadership and to failure of a full appreciation by the public as to the real purpose of the work, projects of this type were encouraged spasmodically and only as a temporary enterprise for the purpose of interesting the children in the less permanent phases of farm and home life.

The Federal Department of Agriculture took up the project as a definite means for the improvement of southern agriculture in 1908. Its first efforts were devoted to activities in a very limited territory. In the year 1912 the movement was projected into the North and West. Later, by the enactment into law of the Smith-Lever Bill the work was quickly and effectually spread throughout the Union. As a result, national, state, district, and county club leaders and extension specialists, together with county agricultural agents and home demonstrators, are in evidence everywhere and are well organized, definitely working out a program for the improvememt of American agriculture and home life. A great deal of Federal and state money is being spent each year for the improvement of the farms and homes through our boys and girls. In the year 1916, it cost 79 cents per capita for the year to supervise, direct, and handle this type of work in the 33 northern and western states, and this includes the total investment of local, state, and Federal funds.

For this investment, the boys and girls produced food products valued at $20.96 per capita, thus showing a profit on the investment of $20.17 for each club member. This economical value is, of course, by far the lowest measure we can give to a constructive educational project. In the year 1917, it cost 63 cents per capita to do the work; as a result the boys and girls produced a per capita food supply of $22.70, and by so doing created for themselves and the nation a fundamental basis for war time thrift.

Types of work undertaken. The most important work undertaken in every state in the Union is known as the Boys' and Girls' Club Work. This simply means that every club member who signs up for any given farm or home project for a year, or given period, agrees to participate in all the activities of the club group under the direction of a club leader. This he or she must do in addition to the regular work of his or her project, such as the growing of a garden, raising of farm crops, feeding

FIG. 247. It is the little efficiency details that count in economical canning. Club work enables children to learn these methods and facts—by using them in actual cases.

of farm animals, or in the carrying on of a definite program of canning, cooking, bread baking, garment making, or home management.

The club program outlines the work of a project for the club group covering a season, a year, or even a series of four years, and including a crop-rotation plan. Club members keep their own records of crops, receipts, and observations, follow carefully all instructions and directions, attend field meetings, demonstrations, club festivals, and contests. As a result of their own or collective achievements they are often honored at banquets, achievement-day programs, and by invitations to go on educational trips to state capitals and to Washington, D. C., where they become guests of the first citizens of the state or U. S. government.

In connection with the local, state, and county club work, leaders often conduct special programs for the purpose of follow-up work and reinforcement, such as boys' and girls' institutes, midsummer camps, boys' and girls' club fairs and festivals, boys' and girls' short courses, and movable schools.

In addition to this, most of the meetings held for adults, such as farmers' institutes, agricultural meetings, and other similar occasions, have provided for a Junior Department, having a special committee in charge of the boys' and girls' section. Through this committee and the adult leader the direction of the work is made more effective. Practically all of the local, county, district and state leaders have arrangements at state fairs for junior exhibit divisions. Not only has this made the boys' and girls' work popular and more definitely appreciated by the general public, but it has proved a pleasing addition to the fairs and increased their attendance and educational value. Through these exhibits thousands of boys and girls in every state have learned what is meant by a pure strain of seed, purebred stock, egg-laying strains of poultry, and market standards and quality of food products; and thus there has been worked out for the soil and the barnyards higher standards for grain, crops, and livestock. So the boys and girls have come back the next year to demonstrate that they, too, know how to produce high-grade products and animals.

Club work an American type of education. Boys' and girls' club work is an organized system of extension teaching for young people in agriculture and home economics, and is usually conducted by means of group meetings, home work in agriculture, home economics and related enterprises. In connection with this work practical demonstrations are conducted, first by leaders, then by club members, for the purpose of illustrating the good practices for the farm and the home. Club work contemplates the organization of young people into groups, in order that the members may reinforce one another and that leaders may more effectively deal with the members in their home projects. In addition to following the instructions for the carrying out of the project on the farm or in the home, members also agree to follow the instructions with reference to their club programs. This type of education has been truly called the "made-in-America education" and is one of the most efficient agencies for the interpretation of the theory of classroom, textbook, and laboratory in the terms of actual practice on the farm and in the home. As an agency for the bringing about of a closer relation between the school and home it has no superior. It is responsible for the giving of proper guidance to teachers and leaders in the best methods of approaching the home and of getting into the life of the child by means of personal visits to the back yard and to the kitchen. It represents a back-yard and back-door entry to the home rather than the front-door and parlor entry. When educators have thus learned how to approach the home through the avenue of practical projects it becomes natural for them to give motive to the interests and studies of the child at school, and to seek the whole-hearted coöperation of parents and friends at home.

The Corn that Won the Championship

This is the corn that won the championship.

This is the boy that raised the corn that won the championship.

This is the neighbor all forlorn, who, whenever he waked in the early morn, could hear the rustling of the corn, agrowing away, getting taller each day, on the opposite farm across the way, where lived the boy that raised the corn that won the championship.

This is the way the boy replies—"To raise such corn, just fertilize—and plant good seed and tend it well," in fact that's all there is to tell, to the man that wanted to know, how the boy could make such large yields grow,—thrice as much as the neighbor all forlorn, who, whenever he waked in the early morn, could hear the rustling of the corn, agrowing away, getting taller each day, on the opposite farm, across the way, where lived the boy that raised the corn that won the championship.

—MEL RYDER

Home economics. The importance of providing special extension work for the women and girls on the farm has been recognized. The result is the employment of women county agents or home-demonstration agents. The woman agent organizes clubs of women, gives them instruction, conducts demonstrations, and superintends the putting of the lessons into practice in the homes. Among the problems now being taken up are children's welfare, the selection, preservation, and preparation of food, the canning of fruit and vegetables on the farm, the selection and protection of water supply, sewage disposal, house ventilation, household equipment and management, the use of labor-saving devices and machinery, and the control of insects and other pests.

Work of specialists. Both the state agricultural college and the United States Department of Agriculture employ specialists in agriculture and home economics. These workers aid the county leaders, and also give instruction to farmers in counties where there are no agents. The principal lines of extension work of this character conducted in the Department of Agriculture, through the Bureau of Animal Industry, are hog-cholera work, pig and poultry clubs, dairying, and animal husbandry.

In hog-cholera work, veterinary field agents have been appointed to coöperate with county leaders and to demonstrate to them and to local veterinarians and farmers the prevention of loss from hog cholera and of the spread of the disease from herd to herd by the use of the serum treatment and by proper quarantine and sanitation of premises.

In dairy extension work, specialists are appointed to conduct work in the various states, through county leaders and otherwise, by organizing cow-testing and bull associations, teaching the keeping of herd records, planning the construction of silos and the remodeling of dairy barns, milkhouses, and other dairy buildings, establishing feeding demonstrations,and instructing in the management of herds and in the solving of other special dairy-farm problems.

In soils, forestry, plant pathology, marketing, and rural organization, also, specialists are employed to carry on extension work.

Extension schools and farmers' institutes. Courses of instruction, accompanied by demonstrations, illustrated lectures, and exhibits, organized and conducted by specialists attached to the agricultural colleges, are given in different localities. These courses usually extend over 5 or 6 days.

The late Joe Wing once said that the first farmers' institute was held when two farmers, working in adjoining fields, leaned over the fence and talked to each other. Certain it is that the farmers' institute represents one of the oldest and best known forms of extension work. As has been well said, "Modern extension service of the agricultural colleges had for its mother the university extension idea and for its father the farmers' institute." Farmers' institutes, as we now know them, had their beginning informally some 50 years ago, when farmers all over the country, aware that the soil was becoming less productive, gathered together to discuss ways and means of improving farm methods. As the state experiment stations developed, and won the confidence of practical men, the research workers from the colleges were asked to meet with the farmers.

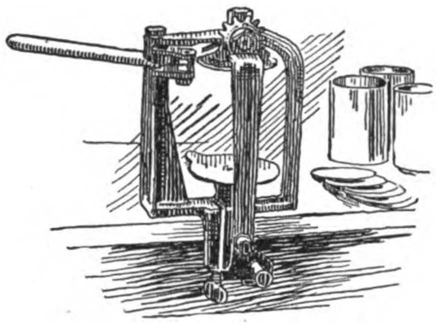


FIG. 248. A small hand sealer for No. 2 cans suitable for both home use and the needs of a small canning club

In 1896, there was formed what is known as the American Association of Farmers' Institute Workers, as an expression of the belief that "the farmers' institutes of each state and province (of Canada) should be guided by some central authority which recognizes the agricultural college and experiment station as the leaders of our system of agricultural education, and the farmers' institutes as a strong, active, and effective ally."

Farmers' institute specialist. The usefulness of the institutes, supported by state appropriations, and often conducted by state boards of agriculture, became so evident that Congress, in 1903, provided for a farmers' institute specialist in the Office of Experiment Stations. His duties were to investigate and assist institute work and to make known in a practical way what was being done by the Department of Agriculture. John Hamilton, then secretary of agriculture for Pennsylvania, was appointed to the office. In Bulletin 241 (1911) of the Office of Experiment Stations Mr. Hamilton said: "An examination of the institute laws of the several states reveals the fact that, while they differ in their form and requirements, as well as in the authority they confer and the amount of money they appropriate, yet they are one in purpose to aid farming people by affording them opportunity to secure the latest and most reliable information relating to agriculture and to receive definite information through a living teacher."

The Chautauqua system. The Chautauqua

system is an effective educational force. During its season of 1916, it held over 3,000 assemblies which reached about 5,000,000 people. While most Chautauqua gatherings are held in villages and towns, so great has become the importance of agriculture that it is customary to devote a day to subjects that are, first of all, of interest to farmer folk. Where this is not done, the program for the week (Chautauqua assemblies average about this period) almost always includes at least one address on agriculture. In this work, the great difficulty has been to get speakers and demonstrators who not only know agriculture, but who are able to present the subject in a pleasing and entertaining manner. In various places, notably in the Central West, the farmers' Chautauqua assembly is becoming quite common. In these gatherings, practically all the addresses and demonstrations have to do with agriculture. Only enough musical and other strictly entertainment features are added to lighten up the program, and, where possible, some home talent is used. The attendance at such meetings has been large and the benefits far-reaching.

Other extension work. Many other kinds of agricultural extension work are being carried on. For example, special trains carry lecturers and illustrative material (often including livestock and grain) and attract thousands of visitors. In contrast with these sometimes spectacular methods are the home reading and correspondence study courses. This method has rapidly won the confidence of the public, and is yearly adding to the thousands of people who are reached and helped. In a number of states, teachers' extension courses are offered. The publications of the United States Department of Agriculture represent one of the most generally used and most valuable forms of agricultural extension work. During the year ending June 30, 1915, the Department mailed 26,386,661 copies of its publications.

The situation as regards agricultural extension may be summarized as follows:

1. There is a desire on the part of the American farmer to improve himself in his vocation. This desire seems keenest between the ages of 20 and 30. It is not clearly defined, but awaits the definition by an outside agency.
2. The states need extension service in agriculture.
3. The main aims of extension service are: to (a) give technical information; (b) give inspiration, create a proper mental attitude, etc.; (c) give general education; (d) discuss the applicable values of new discoveries.
4. Agricultural extension work is most efficiently done through the following agencies: (a) agricultural colleges; (b) the United States Department of Agriculture; (c) secondary schools; (d) a few commercial concerns; (e) the agricultural press; (f) state normal schools; (g) the elementary school.
5. Demonstration of scientific methods on a farmer's own farm, he himself doing the work in coöperation with an agent or institution, is the most effective form of extension service. The tendency is toward less teaching and more of other forms of extension work.
6. One of the most promising forms of extension service is the county farm bureau, or county-leadership movement. Where the farmers' organization provides for the expenditure of adequate sums of money, and where a paid agent of expert caliber directs this organization, the farmers may hope to come into their proper relations as business men of the country, and to bring to themselves all that education, science, and society have achieved for the development of the people.

SOME THINGS WORTH LEARNING IN SCHOOL

By ELLA VICTORIA DOBBS, *Chairman, National Council of Primary Education; and member of the Faculty of the University of Missouri; Vice-president, Missouri Congress of Mothers, and Parent-Teacher Associations. She has taught in rural communities in Nebraska, Illinois, Utah, Montana and California, being especially interested in manual training, on which she is the author of two text books. No worker can do his best or obtain the best in life if he shuts himself up within one narrow circle of interests. Modern knowledge must be broad as well as deep; and to make it so the farm boy and girl must study other things than crops, soils, animals, and their management. In this way they will not only improve themselves and their normal opportunities, but also fit themselves for emergency work which, when required at all, is of vital importance. As an illustration, since these chapters were blocked out, the subject of "first aid" has received new and increased attention, even to the extent of being incorporated among the subjects taught in a number of schools. The whole problem is one of making boys and girls more fit to take their places and play their parts in life.*—EDITOR.

ONE prominent educator, in outlining a "well-balanced ration" in education, asserts that the aim of education is fourfold and that, in planning a course of study, the child's needs must be considered as follows:

First, physical education, because the greatest need is for a strong, healthy body. Unless one has health, it is impossible to be fully efficient, no matter how fine a mind one may have or how extensive may be one's education.

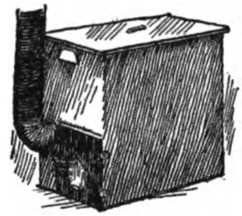


FIG. 249. A good water-bath canning outfit for community or club work.

Second, vocational education, or learning how to earn a living. Everyone needs to be able to maintain himself.

Third, social education. Since we must live with other people, it is important that we learn how to live with them not only peacefully, but happily and helpfully.

Fourth, cultural education, which means learning how to make the most of ourselves and to get the best out of life.

Let us examine each of these four phases or fields of education and see what subjects the children should study, what things they should learn, and how they should apply them to their daily lives, in order to gain these fourfold advantages from their schooling.

Physical Education

A sound body. Everyone agrees that a strong, sound body is the greatest blessing in life. Sickly people have spent fortunes in the attempt to gain health. Quack doctors and get-rich-quick deceivers have made fortunes by offering fake cures for all sorts of physical ailments. A generation or so ago, it was supposed to be a mark of refinement and culture to be "delicate," and stories always described the rich heroine as frail and tender. In a fairy story, a lost princess was proved to be a true princess because she was uncomfortably conscious of the three peas put in her bed, although five feather beds were between those peas and her sensitive flesh.

But times have changed, and we have learned that the poor health of rich people is most frequently due to too much rich food and too little exercise. Instead of being a mark of gentility, delicate health is often an evidence of laziness and gluttony, a cause for shame, not pride. We have learned also that many of the ills that beset the bodies of both rich and poor are not visitations of Providence, but are the direct result of incorrect habits of living. These, in turn, are very often the result of ignorance, superstition or personal carelessness.

The terrible "white plague" of tuberculosis, or consumption, which causes the death of thousands every year, is due chiefly to breathing bad air, and may sometimes be cured if taken in time by fresh air and wholesome food. Numbers of diseases are due directly to improper habits in eating, which interfere with the processes of digestion and elimination and fill the blood with poisons instead of food. Every day these facts are becoming more clearly established and proved beyond the question of a doubt. Every day it is becoming more and more a disgrace to be sick and weak, because, in so many instances, it is a confession that one is willfully careless of the laws of health.

If these things are true, and they are very true, then it follows that the school and the home must combine to teach children how to live properly, how to develop strong bodies, and how to keep them strong.

This study is especially important in rural schools because, being farther away from the centers of population, there is less opportunity to learn through contact with other people, and more danger of bad habits persisting from generation to generation.

What studies will help most in the development of a sound body? First are hygiene and the elements of physiology. A study which merely counts the bones, names the muscles, and locates the vital organs is of little help. The study must teach how the machinery of the body operates and how it must be cared for. It must establish the idea that it is infinitely more important to care for the human machine properly than to give all the care to the automobile or threshing machine. New machines are being turned out by factories every day; but one sound body is all that each of us can hope for to carry us all through life.

The teeth. It must teach not merely that good teeth are a matter of good looks, but that bad teeth are frequently the cause of bad health: first, because with poor teeth it is impossible to chew the food properly, digestion is interfered with, and a long train of evils set to work; second, because the bad teeth are actually rotting, filling the blood with all sorts of poisons, which are likely to cause all sorts of trouble, such as defective eyesight and hearing. A striking example is furnished in the case of a little girl who had had trouble with an ulcerated tooth. Finally, the tooth was drawn. Soon after, she was able to see without the glasses she had formerly been

obliged to wear if necessary. The diseased tooth had affected also the nerves of the eye.

Fresh air. Through the study of hygiene is learned the importance of fresh air in the house, both night and day. Many country residents think, because they work out of doors all day, that they get enough fresh air without open windows at night.

Exercise. It is necessary to take regular exercise which uses all the muscles. Some country folks object to any attempt at athletic games, or other organized physical exercise, on the ground that the children get enough exercise in walking to and from school and in the farm work they must do at home. Organized physical exercise, however, can do what chores can never do, namely, train one to correct habits of standing and walking and a symmetrical development of all parts of the body instead of a one-sided strain on certain sets of muscles.

Slouchy, awkward habits of standing and walking are frequently accompanied by similar habits of thinking. The man who stands with his feet wide apart and his hands in his pockets, while he rolls his tobacco from one side of his mouth to the other, may sometimes be a successful farmer, but generally he is not.

Necessity for proper food. The development of a sound body entails not only good habits, based on sound knowledge of how the bodily machinery works, but also good quality in the food which is to nourish it. What to eat and how to cook it are problems of too serious importance to be left to the chance teaching of untrained mothers. Knowing how to cook tasty, appetizing dishes does not always insure knowing how to choose right combinations of wholesome food. In fact, a reputation as a "good cook" tempts many a mother to injure the health of her family by serving too much rich food; and then, because of her ignorance of food values—the values of different kinds of food in building up the body—she bewails the fate which makes the members of her family "delicate."

Certain foods serve to build bone; others make muscle; still others give heat. It is important to know the food value of at least the common articles of food. Cooking changes the nature of most foods. It is necessary to know which foods are most valuable raw, and which others need to be cooked, and how much cooking each needs. Some foods contain acids and other elements which produce harmful results, when combined in certain ways. It is important to know what these elements are, so that only good combinations may be made. Each meal should be planned to supply the right proportion of bone-, muscle-, and strength-giving food. Foods which produce heat are needed in greater proportion in winter than in summer. Children need different food from that suitable for grown-ups. The farmer, who does hard muscular work in the open air, needs different food from that best suited to a man who sits all day at work which taxes his brain and nerves only.

Why we need to study food values in school. Many of these facts are never mentioned in the home. Indeed, many mothers do not know anything about food values, though they resent the idea of cooking as a school subject, because "the children can learn to cook at home." Many so-called good cooks only know how to give their cooking a good taste and cannot teach their children food values. Therefore, the school must do these things, or we shall go on blundering over the same mistakes.

Clothing. Next to fresh air, wholesome food, and proper exercise, suitable and comfortable clothing plays an important part in the development of a sound body. Badly shaped shoes and tight clothing are our worse faults in this field. Fashion dictates what we shall wear, and people who have something to sell often set the fashions. It is to the advantage of the merchant to make us want new clothing. If he changes the fashions often, we will buy more. We need to know what is good for us, so that we may buy only what we need. We need to know enough about materials to tell cheap imitations from good goods, or we are likely to waste our money. We need to know enough about colors and patterns to choose becoming garments, because strangers often judge us first by our clothes. It is hard to live down our clothes, too, if they are badly chosen. One forms very different opinions about the characters of two girls, if one wears modest colors and comfortable common-sense shoes and the other, flashy colors, cheap jewelry, and silly high-heeled shoes which are too tight for her.

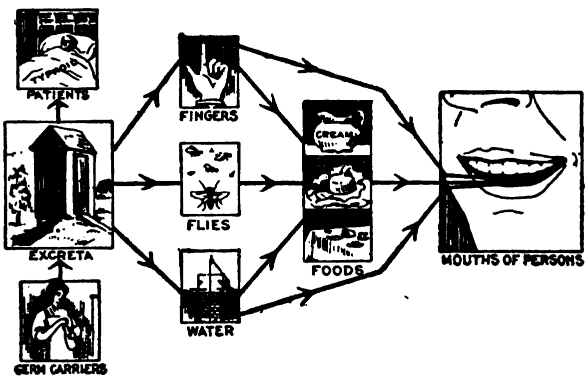
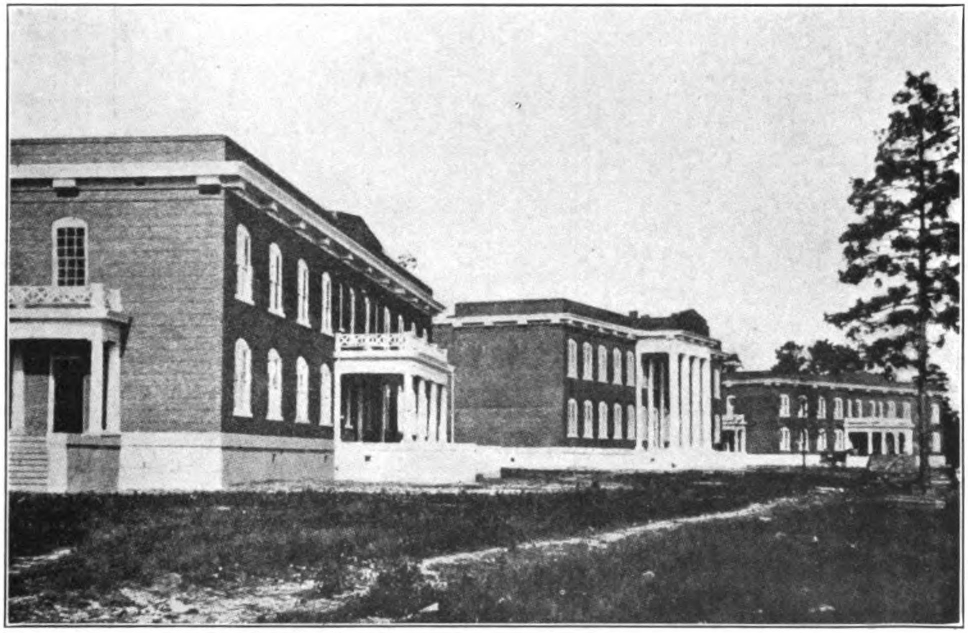


Fig. 250. Everyone should know the ways in which typhoid fever and other diseases are carried, so that they may avoid them. (U. S. Public Health Service.)

A typical one-room rural school almost hidden by the tent used each year by its pupils for club meetings, festivals, exhibits, and other activities



Buildings of the Second District Agricultural School of Tifton, Georgia, a typical modern source of knowledge. (U. S. Department of Agriculture)

AGRICULTURAL EDUCATION HAS NOT ONLY GROWN AND BEEN IMPROVED, BUT ALSO HAS EXTENDED ITS RANGE OF SUCCESSFUL APPLICATION THROUGHOUT ALL THE COUNTRY

A Few of the Buildings of the New York State College of Agriculture at Cornell University. The Agricultural College Has Been Developed to a Degree of Service and Efficiency Rarely if Ever Before Attained by Institutions of Learning

Clothing should express what we are. Knowing how to dress tastefully is one of the things everyone needs to learn.

Sanitation. Sanitation is a term which means keeping absolutely clean. Keeping clean means more than merely washing, even though a plentiful supply of hot water and soap is used. It means freedom from harmful germs, which are too small to be seen, but which cause much disease and waste.

Flies. Flies are responsible for a great deal of disease. Even a few flies may bring to an otherwise clean home germs which may cost the life of a member of the family. Typhoid fever and tuberculosis are examples of diseases caused by germs which are carried by flies, mosquitoes, and other insect pests.

Drinking water. Germs may also be carried through the earth to the well from which the drinking water comes. Some people throw dish water and other slops away where the water can sink into the ground, carrying germs with it into the family well. The location of the well in relation to cesspools and vaults is of the greatest importance. It is important to learn where to put them.

Promiscuous use of cup, towels, etc. Common drinking cups, towels, combs, and other articles of personal use, when used by numerous persons, are often responsible for the spread of diseases more or less serious, such as colds, skin diseases, typhoid fever, and tuberculosis. This applies to family utensils as well as to public cups, combs, etc. Many diseases which "run through a family" may be traced to the unsanitary use of "the family dipper," "the family comb," the roller towel and similar articles.

Sanitation must be taught in school. It is important that school work include lessons in keeping clean. Science is making new discoveries constantly as to the causes of disease and concerning forms of waste. It is necessary to teach these things in school, because all parents do not have opportunity to keep up with what is going on. New books are needed, because the old books used by various members of the family are frequently out of date. Old books are often dusty and dirty, also, and are likely to be carriers of disease.

Preventive measures. Health is our most precious possession. Cleanliness is important in maintaining health. No wideawake farmer can afford to be ignorant concerning the treatment of hog-cholera, for example, or of tuberculosis in cattle, or of any other diseases which are liable to destroy his year's profits and more.

FIG. 251. The use of the individual drinking cup should be taught and practised both at home and in school.

It is at least as important that we study the cause and prevention of the preventable diseases which attack members of the family. Thousands of babies die during their first year. Most of them die because of ignorance or carelessness on the part of those who care for them.

Every school should teach the known facts regarding common diseases which may be avoided by proper attention to sanitary conditions; every school should teach methods of preventing the spread of contagious diseases; and every school should teach something of the care of little children, in order that, later on, the boys and girls may become intelligent, capable fathers and mothers.

Vital secrets. No course of instruction on the care of the body is complete if it does not give the children the fundamental truths about the laws of human reproduction. It is a sad fact that knowledge of this most important and most sacred function is not only left to chance, but is surrounded, in many instances, with vulgar ideas. Right teaching on this subject is especially needed in the country, where children early learn the physical facts from observation of animals. Unless right teaching establishes higher ideals, the children will associate every thought of reproduction with coarse, animal connections, and will know nothing of its sacred responsibilities. Nature has made children curious on this subject. If we do not give them the information in a right way, they will get it in a wrong way. We owe it to them to satisfy their curiosity with pure thoughts and to teach them how to keep their bodies and minds pure.

Vocational Education, or Learning to Earn

To be able to earn a comfortable living requires at least fair skill in at least one kind of work.

A few years ago, a great deal of fun was poked at the "book farmers." In some quarters, there are still to be found people who do not understand the value of scientific knowledge and who think they can guess at the way to do their work, and get along well enough. But those who have tried and proved it know that it saves time and saves money to *know how to do one's work without making mistakes.* Mistakes are the most expensive things we pay for.

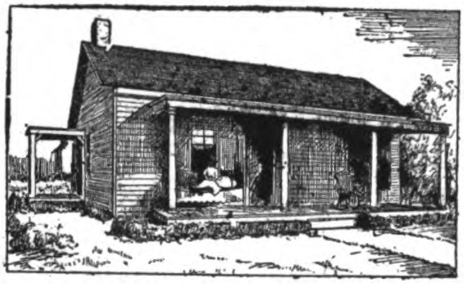


FIG. 252. A neat, comfortable teachers' cottage. Only amid congenial surroundings can a teacher do her best and take a real interest in her work. (See p. 306.)

It pays to know how. Science is often thought of as a high-school or college subject; but there are many scientific facts which may be taught in the lower grades and which are of great value to the farmer. Children can learn a great deal about the growth of plants and animals; about the best way to cultivate and raise them; about the diseases which attack them and how to cure them; about the pests which beset them and how to get rid of them. They can learn much about soils and fertilizers. They can learn how to collect and test seeds. They can gain some real experience of a definite sort by working with small plots, either on the school grounds or at home.

In such work, they learn how to do with a small quantity, and lessen the chance of making mistakes with large quantities later. They also have the benefit of working under careful direction. Not only is this sort of study helpful, but it adds to the interest of school work; and children are more willing to stay in school till they have learned enough to make a success of their lives.

Employ a good teacher. Of course, if the children are to get this knowledge in school, a teacher must be employed who can teach it. If the community employs a cheap teacher who cannot teach these subjects which mean so much in the success of work out of school, the children are likely to get tired of school and to want to go to work before they are prepared to earn a good living. Because the children are ignorant of the real causes, they will blame the weather for their poor crops, when it is the fault of poor fertilizer, or poor seed or some other thing which might have been controlled had they only known how. *It pays to know how.*

Besides learning scientific facts about the growth of plants and animals, it is necessary to learn business methods of management. Some of the foregoing chapters have put emphasis upon the value of systematic methods and upon the great loss in time and money which comes through lack of system. Much that is essential to success in farming may be learned in the early school years, if the teacher knows how to teach the children to form systematic habits. It will save money in the end to pay more to a good teacher who knows how. It is a waste of money to pay anything to a poor teacher who permits the children to form bad habits.

To read and write and count are necessary tools of learning which the school must teach the child to use. The important thing is the use he makes of these tools. Knowing how to read will be of little value, if he does not know what to read. Even reading good books will be of slight advantage unless there goes with it a habit of putting ideas into practice.

If the children are to be taught to take care of themselves successfully, they must begin early, both at home and in school, to carry responsibility, first for small things, next for larger things. They must learn to think things out to the end before setting to work. They must learn to stick to a job until it is finished. They must learn how to choose the best methods by which to do the work. No amount of ability to remember dates or to bound states or to work long problems in fractions will take the place of this knowledge.

These habits can be cultivated in school, first in the plays and games of the little folks, later in small projects which the older children can carry out.

Though these projects sometimes seem like play, they are planned to develop the good qualities listed above. Patrons often hinder the work of the school by objecting to any form of school activity which is different from the way things were done in their own school days. They forget that school methods, like farming methods, are improving all the time.

Manual arts. Various kinds of handwork are useful in helping to form the habits specified above. In handwork projects, it is necessary to plan things out before setting to work. Otherwise, the work is likely to be a failure. If the worker does not stick to his job till it is finished, the unfinished work is there to accuse him. He cannot forget it as he can an unlearned spelling lesson. It is easy to see the advantage of using right methods of work when skill brings a better result. Besides training in good habits, lessons in handwork should teach the children how to do many useful things needed both on the farm and in the town. The children should learn to do many things which, later on, save the expense of calling in a carpenter or a blacksmith.

Every boy and every girl should know how to do some useful work well enough to earn a living by it. It is as important for the girls as for the boys to be prepared for their part in life's work. It is not easy to measure the money value of knowing how to cook the right sort of food well or to take proper care of a family of children. It is easy to measure the cost of ignorance, when doctors' bills must be paid. It is impossible to put a money value on the comfort that comes from knowing how to keep the household machinery working smoothly, yet much of our health and happiness depends upon these things. They are too precious to be left to chance. They are too important to be learned only by the few who have capable mothers, while the rest miss them altogether. Girls as well as boys *should know how to do their work in the best way.*

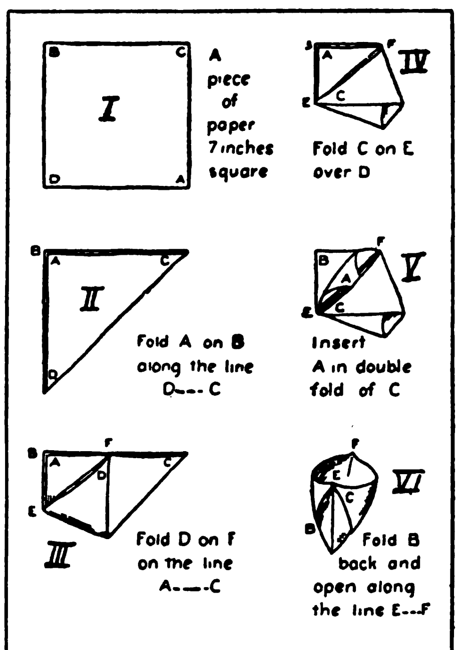


FIG. 253. Six steps in making a sanitary, paper drinking-cup. Every child should know how to do it. (Cornell Reading Course.)

Social Education

Social education includes everything that will help a community to be neighborly and to pull together. Every farmer knows how hard it is to move a heavy load with a team which will not pull together. Every preacher knows how impossible it is to accomplish good work in a community which is made up of factions which will not pull together. Every teacher knows how hard it is to teach school in a neighborhood where the people are divided into groups which pull against each other.

Success in football and many other games depends on team work. In all community life, also, team work is necessary. Team work means that all members of the team must work for the same thing at the same time and pull in the same direction. Failure in all community work comes when some

of the members refuse to work unless they can work as they please and when they please, or unless they can "boss everything."

Children in school need to learn to work together as well as to work independently. It is necessary sometimes for each one to sit in his own seat with his own books and papers, and work out his own problems or write his own essays all alone, in order that he may learn to depend upon himself. It is just as important that at other times he shall do his share in a large undertaking. He must learn how to give up his personal wishes when another way is preferred by the group. In a democracy, the majority must rule. The serious opinion of thoughtful people generally places a majority on the right side. The boy must learn to do hard or disagreeable work for the good of the group, even though he gets nothing out of it himself except the satisfaction of having done his duty.

Club work. Club work of various sorts, athletic teams, school festivals, and pageants, group plays and games all help in this necessary development of the social side of life. These enterprises help in two ways at once: (1) in athletic sports, strong bodies are developed while the children are learning team work; (2) clubs in cooking, sewing, canning, corn growing, stock judging, debating, and in other fields all help the children to gain a great deal of practical knowledge, while they are learning to work together to make a good record for their school.

School festivals and pageants stimulate a strong community feeling by centering the thought of the entire community on one purpose. The same spirit which, in school days, helps to make a success of the school play will, in later years, work for good roads and a better schoolhouse.

These social activities are important, also, in making country life attractive. Boys and girls soon discover that there is always something going on in the city. Country life must be made equally attractive, if children are to be kept on the farm and saved from some of the evils of the town.

All young animals play. We were all intended to be happy. Children will find a way to be happy if they can. If we do not provide wholesome fun, they are likely to find the other kind. School life should teach right ways of having a good time, and train people to work together for the community good.

Cultural Education—Learning to make the Most of Ourselves

Cultural development, as stated above, means both making the most of one's capacities and getting the most out of life. "Eyes have they and they see not; ears have they and they hear not" is just as true to-day as when spoken hundreds of years ago.

One person walks along a country road and tramples a wayside flower without seeing it. Another person, whose eyes are open and whose mind is alert because he *knows*, sees not only that wayside flower, but thinks about thousands more of its family, scattered over the earth; knows the value of its root or of its leaves in medicine; sees its cultivated cousins blooming in stately gardens; knows the lines a poet has written about it, or a part it has played in history. One person kicks aside a pebble in his path. Another picks it up and reads in its form and color the world's history; reads of glaciers and earthquakes, of floods and volcanic fires. One person looks at a horse and sees just a beast of burden. Another looks at the same horse and sees the qualities of its ancestors for generations. And what makes the difference? One knows the secrets of botany, geology, and biology; to the other this knowledge is a sealed book.

FIG. 254. The joy and value of nature study

Things are going on about us all the time which are more interesting than novels, more thrilling than moving-picture shows; but we are often blind to them because we do not know they are there. Life is never dull to people who really see and hear what is going on. The student of human nature reads the differences in people as the

stockman reads animals or the geologist reads stones. People show what they think about, in their faces, their manners, their walk, and their clothes quite as much as in what they say.

The three R's not enough. Some people (farm folk among them) think that the "three R's" are enough to learn in school. Enough "readin" to get the news from a daily paper, enough "ritin" to send a letter to the boy in town, and enough "rithmetic" to figure up one's savings, may make it possible to get along, even in these days when learning counts; but it does not make it possible to get the best out of life.

In thinking of the things which children should learn in school, both parents and teachers need to remember *why* they should be taught. A study of books which tell of the secrets of nature and of the fine things which the best of humanity has achieved will not only give us pleasant things to think about while we work with our hands, but will fill our souls with higher ambitions and awaken the best that is in us.

We need to teach art in school, not because we expect to make artists of the children, but because in attempting to paint a flower or a sunset, the children come to appreciate their beauty and find joy in them.

We need to teach music, not to make musicians, but to express our deeper feelings. When the work of the day is over, a little music is both restful and uplifting. It adds the crowning touch to the family life, and helps make the home ties strong enough to hold the boys and girls.

Life on the farm, because it lies so close to nature, because it is in the midst of trees and birds and flowers, of herds and fields of grain, ought to be accompanied by the highest thinking and the greatest refinement. The quiet of the country life, away from the noise of the city, encourages thinking in minds that are stored with material for thoughts. Dreams, perhaps we call them; but the greatest success in life comes only to those who can think out plans, who can imagine something better than they have, and work to make their dreams come true.

Making the most of oneself. Getting the most out of life includes developing all one's talents to their highest capacity. Not every farmer's son has the qualities needed to make a successful farmer. Some cannot take the lead and manage alone, but will succeed better earning a salary under another person's direction. Some will have strong powers in other fields. We are proud to count the great statesmen and leaders in other fields who spent their childhood in the country.

The country school should offer at least the beginnings of a broad education through which every pupil may find himself and discover what he is best fitted for. "There ain't no great good to be reached by tiptoeing children up higher than ever their fathers was teached," said a backwoods school visitor; but the world is moving forward, and unless your boy and girl move with it, the world will leave them behind. They need opportunities which you did not need a generation ago.

Modern science has changed the world's ways of working and living. In every field, greater preparation is needed, if one is to succeed. The children must begin where the fathers are leaving off, and must "tiptoe" much higher or else fall behind. The country school must give country children a preparation as good as the best—nothing less is entirely worthy of them.

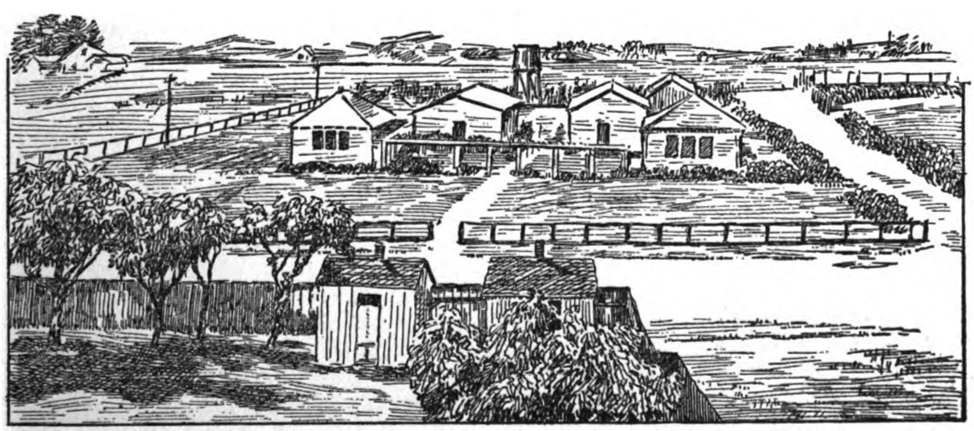


Fig. 255. A rural high school in California that accommodates 89 students. The building cost $5,500, the equipment cost $2,500, and the maintenance cost is $8,500 a year. It has nine acres of land on which the pupils have planted some twelve hundred fruit trees. ("Journal of Agriculture," University of California.)

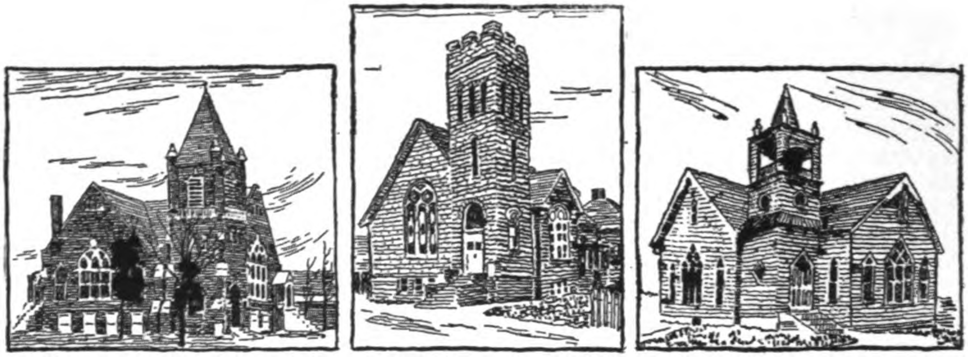


FIG. 256. These three churches are in a large, progressive Indiana village in which there is a consolidated school. Compare with those shown in Fig. 259

CHAPTER 15

The Farm Community

AS FAMILY life is simply a larger expression of the life and activities of the individuals who compose it, so community life, in the main, represents the collective experiences and tendencies of its family units. This is especially true in rural districts where the families are fewer, more distinct, and yet more dependent one upon another, than in the cities. In every city there are thousands of families that do not know by name or sight one out of fifty of the families that live within a block of them; indeed, it is not unusual for the tenants of the same apartment house to remain unknown to one another for years.

Such isolation is practically impossible in a farm section. Each family is too obviously a sharer in the community activities, too big a factor for good or evil, too rich in its promise of neighborliness and coöperation, to remain unknown. Even though tastes may differ and social or political or religious affiliations fail to correspond, there is the common ground of community development upon which all can and must meet and join forces.

Under these circumstances, the full development of community life becomes not only easier but also more necessary. The farm community is not a center of interests as the city is. It is a producing rather than a consuming point; its products are, usually, not concentrated but shipped away in small consignments; it does not attract business nor the recreations and interests and multitudes that follow the lead of trade and commerce. On the contrary, it is self-supporting, self-amusing, self-instructing, self-developing. The problem of making its life useful, efficient, full and productive is, therefore, in some respects simpler, and in others harder, than that of any city.

This problem involves two stages. The first is the creation of community interests and activities—of a community spirit; the second is the maintenance of that spirit at the point of greatest vitality and benefit. Each of the phases of farm community life that are discussed in this chapter must therefore be considered as having two possibilities; the first that of community builder; the second that of community supporter. Thus an organization may be formed and, perhaps, unconsciously, create a new, unified, progressive sentiment in the village or township. But its work does not stop there; it must continue to interest its members, to hold them together and to keep them active in its behalf and in that of the community. So with the church or the school as a center, or the institute as an awakening point, or the historical

pageant as a creator of local pride; each must not be merely a flash in the pan, a valuable temporary experience; it must be perpetual and constantly growing in scope and improving in effectiveness. Let each individual take it upon himself or herself to be a little better citizen, a little kinder neighbor, a little heartier booster of the home town or county. Let every family express and strive to carry out the same endeavor. So will be born and flourish a community life that will serve and prosper, that will be a joy unto itself and a source of pride and strength and honor to the Nation.—EDITOR.

THE CHURCH AND THE SCHOOL AS COMMUNITY BUILDERS

By MRS. HELEN JOHNSON KEYES (*see previous chapters*) *whose interests are, and long have been, with the people of the country. As already indicated* (*in Chapter 14*) *the educational systems in the country are undergoing great and admirable changes—changes that are making them more practical, more useful, and broader. As religion is an even more personal matter than education, the country church has been slower to feel the pull of modern tendencies. But a long step forward has been taken in more than one community, and the number of localities is constantly increasing wherein it has won a secure place as the center of community interest.*—EDITOR.

THE church and the school are among the greatest of community builders. As country people, we are coming more and more to appreciate just what the rural church and school mean to us. Each year we value them more highly and see in their work a real call to service.

The pioneer's church. Long ago, farming was a more lonely occupation than it is to-day. The pioneer farmed for his own family alone, and manufactured crudely for his own needs; consequently, he was brought very little into relationship with the world or even with other families. Because of the conditions under which he lived, his religion was largely personal. It was a message of salvation to his own soul, and came to him through conversion and faith, making no demands upon him for what we to-day call social service; for there was then no community to serve. The revival, held once or twice a year, and an occasional religious service on Sunday, were sufficient.

By and by the scattered, lonely cabins of the pioneers were replaced by groups of farmhouses. In this period, religion added to its message of personal salvation insistence on personal purity, temperance, and faithfulness to family obligations.

The community church. To-day, the farmer has been brought more fully into the commonwealth of the world. He is no longer isolated and independent, disputing his rights with wolves and savages; he is no longer confined to his own home, a rival of his neighbors, depending on their failure for his success. He is a member of a community and related to the whole world. Therefore, his religion, in addition to being a message of personal salvation, and besides insisting on family obligations, lays upon his church and upon him the duty of building up the neighborhood.

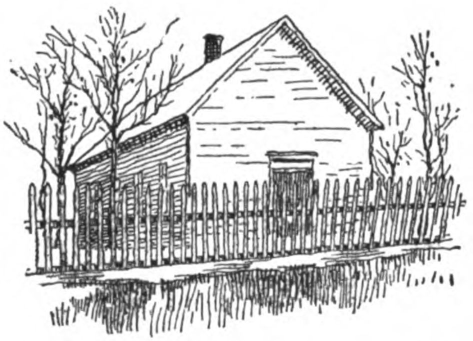


FIG. 257. A deserted church may mean that it has been discarded for something better, but usually it points to a lifeless, unprogressive community.

The Church as a Community Builder

What the church ought to mean to the community. Much fault has been found with the old-fashioned parlor, which was opened only when the preach-

er came. May we not also justly criticise the church that is opened only when the preacher comes, and especially so when there is preaching but once a month? The church ought to, and must, if it is to fulfill its highest mission, mean more—to country boys and girls especially—than a gloomy, musty building back of which is the graveyard.

The community house. Where there is no community house, the church building or the schoolhouse should become the common meeting place for the people. It is fortunate if the church building has special rooms, such as are found in modern city houses of worship and in some country churches; but these are not necessary. The important thing is to use, for the greatest good of all the people, such room as there is. People who go to the church house for pleasure, for instruction in farm work, or for conferences, will go there to worship also.

Play as well as prayer. The churchyard should extend well back from the road, and should be large enough to afford, in addition to hitchyards for horses and parking grounds for automobiles, a playground for the young people—for all who are young in spirit, even though they may be old in years. Play is nature's safety valve; and it is a fine thing if this play can be under the direction of the pastor, or, at least, can be where the influences are good. It is a wise country pastor who understands the value of organized play, who sees in a baseball nine, a basketball team, a band, an orchestra, or a chorus real possibilities for developing team work and leadership. These qualities lead to community pride, contentment, and appreciation.

The kind of preacher needed. In rural churches, we must have pastors and priests who understand and who are in sympathy with farm life. There is a true story of a priest who came to a poverty-stricken parish in the open country. His people were too poor and too discouraged to support the church. Not all the most eloquent and inspired sermons in the world would have made it possible for them to contribute enough money or time to their church to make it strong. The priest saw this. He studied the soil and found that the people were poor because they were trying to raise crops to which it was not adapted. He became convinced that dairying was the proper industry for the region, so he learned a great deal about dairying, and at last built a cheese factory. In 10 years the parish had become so rich that it erected a beautiful stone church out on the country road. By creating a sound agricultural practice, this priest built up a community which, in its turn, supported a vigorous church.

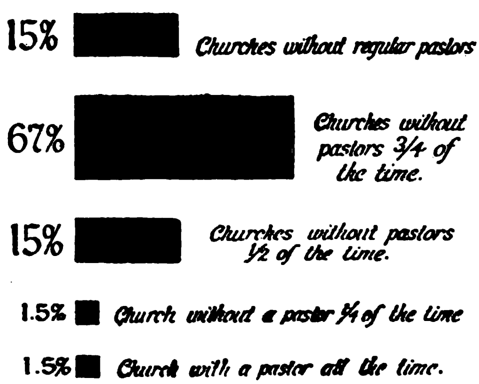


FIG. 258. Chart showing how the reduction in members of country congregations is influenced by the amount and kind of religious guidance provided.

We must have a resident minister. Only the minister who is right out in his field can get the best of team work from the men, women, and children of his congregation. He must know which boys have community pride and good business sense, so that they will, for instance, work hard to repair bad bits of road and thus reduce the cost of hauling. He must know his men, and direct the right ones along the paths of leadership in buying and selling and in the opening up of markets as well as along strictly religious lines. In so doing he will make possible stronger country churches, although these

churches will not always be like city churches. It is within the power of such a preacher to make those with whom he labors feel that honest agriculture is only just below the Ten Commandments in holiness, and to give them a vision. Without a vision the people perish. This is especially true of country people, who too long have suffered for lack of vision and want of leaders.

What the church needs from the community. Every church needs a united, devoted people. No minister can do his best work unless he has a congregation of considerable size, and one which is interested and able to support the church with labor and money.

Kinds of Churches

Four types of churches minister to the farmer, but there are certain demands which each of them makes upon its community. We have (a) the church of the open country, (b) the church of the hamlet, (c) the church of the village, and (d) the church of the small city.

The church of the open country. The church of the open country, 95 per cent of whose congregation are usually farmers, and which is from 7 to 20 miles from a trading center, needs a group of permanent landowners, practising sound agriculture, supporting happy homes and practical schools, and living near enough to one another and to the church to permit attendance on Sundays as well as at the society meetings and socials. The church of the open country cannot thrive if the neighborhood which belongs to it geographically is divided up among too many denominations, each seeking to support its own congregation; for small groups of people are not able to feed enough strength into a church to make it a community power. The result is merely a number of poverty-stricken, weak worshiping places, often without resident ministers, and unable to meet the call of present needs. The church of the open country demands that rural people unite in making the church a constructive influence, under a pastor who is more than preacher and who is paid a fair salary. He should live in the country and close to the church. This means that there should be, near every live country church, a parsonage together with at least a few acres of land.

The preacher need not be the best farmer in the community; he need not attempt to become the community farm adviser or agricultural agent, but he should have a fair knowledge of farming. Without this, he will often feel at a loss in talking with the people of his congregation, and may actually lose in influence. Many a man can reach another through an understanding of his work, when he cannot do so in any other way. Nobody questions the value of agricultural knowledge on the part of the country banker or the country newspaper man. Surely it is just as important for the country preacher, who is brought into closer touch with the people than either of these.

Many successful pig clubs, calf clubs, colt shows, and community fairs have been built up around country churches. Through such movements are worth-while country things revealed and new possibilities pointed out. Thus are more people interested in the country and kept there, and the rural church strengthened.

The church of the hamlet. The church of the hamlet, about 75 per cent of whose parishioners are farmers, makes this same demand upon

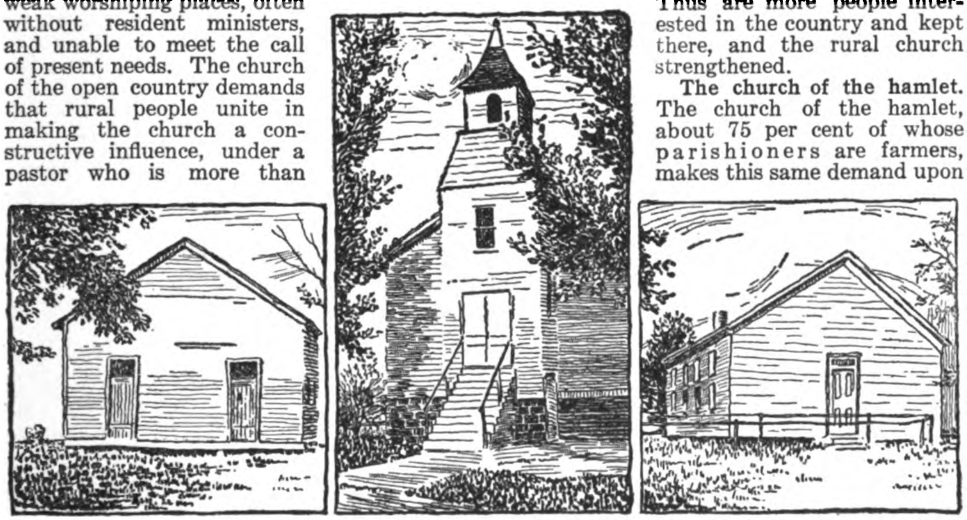


FIG. 259. Three churches in an Indiana village of forty inhabitants. That at the left is dead; that at the right is dying; that in the center is furnishing the religious life for the whole community. The smaller the field, the more effective and economical is consolidation, whether in church or in school organization.

FIG. 260. People's hall in Honey Creek, Wisconsin, used, under the supervision of the church trustees, for farmers' institutes, lecture courses and community entertainments, as well as church functions.

us, and the demand for the same kind of pastor. It is more closely in touch with schools, with merchants, and with social agencies than is the church of the open country; and it asks of us constant coöperation with schools, business, and all the organized and unorganized resources for pleasure which help to make the hamlet a center. It demands our assistance in creating intelligent, honest, and wholesome influences which shall give stability to the hamlet itself and prosperity and permanence to outlying farm homes. It needs progressive teachers who will bring good schools and real homes close together; honest farmers and traders who will work, not against one another, but with one another. If we encourage these things, we shall form a neighborhood which, in its turn, will support a strong church.

The village church. The village can often support two or more churches, provided the surrounding countryside is not already supplied with an open-country or a hamlet church. As more miles of good road and of trolley lines are built, and as more farmers own automobiles, the village church is likely to grow in favor with the farmer. At present, he supplies about 50 per cent of its membership. The many occupations represented in it make it finely democratic. This church makes all the demands that the hamlet church makes and more. It cannot prosper unless the members of all the different callings which it represents are working together, both in their business relations, which are constant, and in their religious and social relations.

The church of the small city. The small city, with a population of from 2,000 to 5,000, may support several denominations; and in this way it offers a choice in the form of worship and in its missionary interests which is often welcome. Sometimes one of these churches broadens its field by doing work with an open-country, village, or hamlet church, and in this way becomes a community center for the outlying country. This arrangement requires a minister who is thoroughly rural in experience and sympathy. He should go among his open-country people, and should see that they are brought into touch with educational influences and amusements. It is equally important that the city, for its own sake, be brought into closer relationship with the country. The church of the small city requires democracy of all its people.

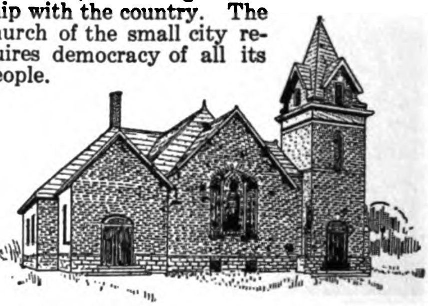


FIG. 261. The church in Honey Creek, the program of which is an important community movement. (This and Fig. 260 Wis. Bulletin 278.)

National organizations must help. It is a matter of vast importance to agriculture that the national organizations of the various denominations should grasp the rural-church problem. Fortunately, there has been a great awakening since the publication of a series of surveys of the country church in various parts of the country. From everywhere (except the southern states which generally suffer little from overchurching) come reports, in regard to Protestant country congregations to the effect that:

(1) There are on an average 80 weak country churches where there is only enough population to support 20 in strength and prosperity. (2) Within 20 years, church attendance has declined from 29 to 33 per cent, after taking into account the falling off of Protestant population in many sections of the country. (3) Country ministers, in proportion to the purchasing price of the dollar, are receiving salaries which are smaller than they were 20 years ago. (4) Of our open-country churches only about 6 per cent, and of the hamlet and village churches only about 25 per cent have resident pastors.

Some remedies proposed. To change the situation shown by the surveys, various remedies have been proposed. Some investigators, who have care-

fully studied the question, suggest fewer and stronger churches. Another plan, and one which might not prove so easy, is to get more workers into the church rather than to do away with all the weak organizations. Attendance figures prove that, in many communities, only a small percentage of the people go to church regularly. This being true, it is plain that not all weak congregations are the result of overchurching. In some states, committees of church leaders are developing programs through which they hope to make use of all the community-building strength of all the rural people. In other states, there have been organized interdenominational country commissions which are discouraging the organization of churches which are not needed.

To educate ministers for rural charges, the Department of Church and Country Life of the Presbyterian Board of Home Missions holds each summer graduate courses. It is urged that Bible colleges and other religious schools be established near the agricultural colleges, where farm life is felt and where it is seen as a reality. Many agricultural colleges are offering special courses for rural pastors, and district and state country-life conferences are common.

The School as a Community Builder

What it is and what it must do. No longer do we feel that education consists alone in learning from books, that the term when we should study ends when youth ends. The old standards served in a way for olden times, when the farmer required little knowledge beyond the three R's and those farming and household practices which he learned in his daily duties. This was the period of self-centered homes. Then the early settler built little schoolhouses a few miles apart all through the countryside. Now, our life has become community life; and our schools, like our churches, must accept a new duty—that of becoming community builders, of making education include social relations, creating a neighborhood. To do this, the school must promote: (1) Homes in which are wise parents and home-makers and where, consequently, sound citizens may grow up; for neither the school without the home nor the home without the school can give children the new education. (2) Such a church as has been described. (3) Organizations which, by combining the various talents and experiences of the people in a neighborhood, may build up a prosperous community.

Schools cannot do this work unless their teachers are in sympathy with farm life and are the friends of every home; unless the schoolhouses are meeting places for the people of the nearby farms.

What the teacher should be and believe in. Mabel Carney, herself a country teacher and a trainer of country teachers, calls these brave men and women "links between the people and their opportunities." So the teacher should, first of all, be a man or woman of vision, and with sufficient training to make others catch the vision. This may mean higher qualifications, but to raise the standard is to take a most important step. The teacher of a country school should be more than an untrained boy or girl who is using the position as a stepping-stone to something else. A trained, educated, and capable teacher is just as necessary in the country as in the city.

First of all, the country teacher should believe in country boys and girls. This means, also, that the teacher should believe in the country as a place to live in, and see in it opportunities for the best talents; for only as we see can we teach others to see. Not to believe in the country is, unconsciously perhaps, to magnify the city while belittling the opportunities open to the country child.

What should be taught. The country school should educate for country life; but, in so doing, it should not neglect to lay a foundation broad enough to be of value alike in city and in country. Not all country-born boys and girls will spend their lives in the country. If we may judge by the past, a large percentage of them will go to the city. Those who would go must not be held back

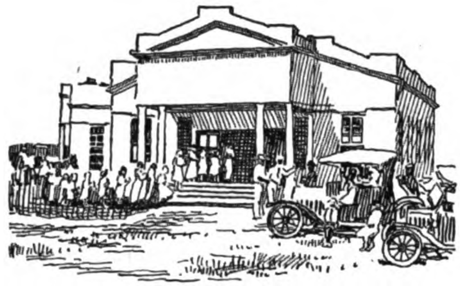


FIG. 262. The choir marching into a federated Texas church in which community interest is well developed and maintained.

because of training that is too narrow, that is so practical from a farm viewpoint as to leave out much for which life has need. At this time, just when almost everybody is making a plea for rural training for country boys and girls, such a statement as this may sound strange. It is important, though, that it be kept in mind. Once in our schools there was but little practical training; now we must not swing too far in the opposite direction, and teach only of barrels and bushels and dollars and cents.

Still, in the country, the teaching should be in terms of country, life, and daily use should be made of that finest of all laboratories, the field. The "why" of agriculture should be stressed. For instance, the farm boy should be made to understand why it is best for him to stir the soil in the cornfield after each rain, even when there are no weeds. And there are thousands of other "whys" which, if answered, will cause the country child to see in his work, however hard, more than dirt and drudgery. The simple laws of animal and plant breeding are full of interest for almost every country child. In brief, the country school, in addition to laying a good general foundation, should stress the things which have to do with the farm.

How to get a good teacher. The wages paid to country teachers have been very much lower than those paid to teachers in the cities. School taxes, also, are lower in the country than in the city. Now, the only way to get good schools in the country is to pay for them, to pay just as the cities pay. Higher wages will make it possible to set higher standards, and to secure teachers measuring up to those standards. This support may seem slow in coming, but as the rural school serves better, it will be more liberally supported.

Politics should have no place in the selection of teachers, nor should family connections be considered. Qualifications alone should determine employment. Proper supervision and larger school units—perhaps the county unit system—with fewer officers will tend to raise the standard of teachers.

A home for the teacher has also proved a great help in the matter of getting and keeping experienced and well-qualified instructors. Farmers have found it worth while to build tenant houses for their farm hands. Why not, then, a home for the teacher?

School buildings. The average schoolhouse in the country is a one-room structure, but not always of the "box-car" type, so common in the past. The old house was an ugly, unpainted one with 2 or 3 windows on each side, a door in one end, rude wooden double seats for the pupils, and a big unjacketed stove in the middle of the room. In the new house, we note a proper arrangement of windows, so as to rest the eyes and save the sight of the pupils, comfortable single seats, some system of ventilation, and, perhaps, a furnace or, at least, a jacketed stove located with some thought as to the health and comfort of the children. Such a schoolhouse should provide not the common drinking cup, but a sanitary fountain, or, at all events, a drinking cup for each child. In many cases, such buildings are provided with good basements, affording furnace room and, on rainy days, a place for the children to play.

We have spoken of the one-room school. We also find in the country an ever-increasing number of school buildings of more than one room. In many of these are removable partitions, making it possible to throw together two or more rooms when a large space is needed to accommodate a crowd.

Get the right kind of building. It is not always possible to vote the money needed to pay for the right kind of a school building. Frequently, the proposition fails at first, only to succeed later, when it is better understood and when the need is more fully appreciated. In this connection, we would suggest that it is sometimes a mistake to be satisfied with a small bond issue or tax levy when more money is actually needed. The easy, sure way is not always the best. Schoolhouses, like other public buildings, must meet future needs as well as those of the present.

When it is not possible to vote a sum of money sufficient to build a new schoolhouse or to add to the old one, such amount as is available may be added to by contributions of cash or labor. Improving the schoolhouse in this way often develops team work and community co-operation of the best kind.

What one community did. A few years ago in a Missouri country district there was an old, weather-beaten, one-room schoolhouse. A new teacher was employed. She was a woman of fine training and of rare breadth of vision. She told the people of the district that they ought to be ashamed of their schoolhouse. They answered that it was impossible to vote funds to improve it or to build a new one. She came back with the very practical proposition that they raise what money they could and do the work themselves. The

FIG. 263. A Minnesota country school building designed to shelter also social, religious and political activities of the community. It has five acres of grounds, and cost about $5,000. It is used as a school during the week, as a church on Sundays, and as a library and meeting place in the evenings.

proposition was agreed to. The schoolhouse was moved over, and the men came with scrapers and teams and picks and shovels. They dug a basement and in digging it, in working together in a common cause, they dug many little hatreds and jealousies out of their minds and hearts. In cementing that basement, friendships, too, were cemented, and the community life was strengthened. Once the work was started, it seemed that everybody could do something, and everybody did.

The opening of school that fall was a great event; for the building was, and to this day is, to the entire community, "our schoolhouse." Well may they be proud of it—one-room structure though it be. In the basement is a modern furnace, a sanitary drinking fountain, rooms for wraps, an oil stove, and a big removable table for use when the weather is too bad for the children to eat out of doors. The schoolroom, properly ventilated, screened, and lighted, is very different from what it was before the people of the district joined hands and went to work for the sake of the children. At the windows are adjustable shades, while paper that is restful to the eyes covers the walls, on which hang a few copies of paintings by great masters. Good slate blackboards have replaced the old wooden ones. Each pupil has a single desk of suitable size. Near the teacher's desk is a telephone, a part of the rural system and connecting with practically every home. Out in front of the schoolhouse, from a pole representing more team work, a flag floats. Wonderful has been the change, yet the actual expenditure of money was very little.

Linking up school and farm. In using electricity, we cannot get results until proper connections are made. Just so with the school and the farm; until the proper connection is made between the two, we cannot develop and make use of the power. A close connection, however, makes the rural school a power house from which wires carrying community-building energy reach to every home in the district. Parents as well as pupils must be interested. Generally, though, the logical method is to reach the fathers and mothers through the children. For instance, a school-district survey made by the pupils will inform the parents of at least one thing that is being done "over there at the schoolhouse." Surveys lead to many questions as to crops, acreages, yields, and values, upon which help is sure to be asked at home. Discussions of farm practices follow. Why was the yield of a given crop better on one farm than on another? In some cases, the conclusion will be that it was due to the difference in soil. If corn be the crop under consideration, instruction on the selection of seed corn in the fall and on the testing of seed corn in the early spring, will be in order. A special "seed-corn day" for all the district, with school-trained pupils leading in selecting seed corn on the home farm, will naturally follow, just as will the school-district corn show later on. In the meantime, boys and girls will have brought seed ears from their homes and tested them in germinating boxes made

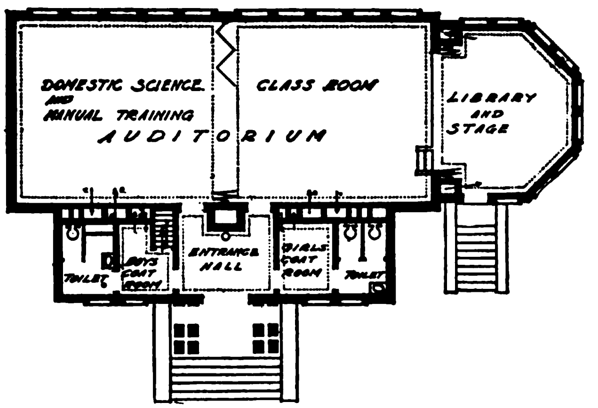


FIG. 264. Plan of the community school building shown in Fig. 263. Folding doors enable the two school rooms to be thrown into one large auditorium.

at school. Out of school corn shows have come many a district or community agricultural fair.

Teaching girls how to can fruits and vegetables may lead to the formation of a school canning club, which is sure to prove of interest to the mothers. Egg circles, through which eggs of guaranteed quality are collected and sold, to the advantage of the district, have been successfully conducted under school direction. Indeed, the formation of clubs of all kinds, especially pig, calf, and poultry clubs, should be promoted as actively as possible.

If only some of the work mentioned is carried out, the schoolhouse is almost sure to become a social center, where the people of the district may meet for pleasure, recreation, and instruction. There should be an active farm club, perhaps a series of farm lectures by representatives of the state college of agriculture or the United States Department of Agriculture, a week's short course in agriculture and domestic science, and, in some instances, an agricultural Chautauqua. In all these activities, as people come to know one another, they come to like one another. Developing team work for community building and betterment is then an easy matter.

"Boys and girls absorb environment," says Professor O. J. Kern, of the University of California, whose work as county superintendent resulted in the beautifying and betterment of the schools in an Illinois county. How important is it, then, especially where the schoolhouse serves as the meeting place for all the people of the district, that the environment—the house, inside and out, and the school grounds, too—should be right. Order, beauty, and cleanliness are considerations which greatly influence the life of the community.

COMMUNITY ACTIVITIES FOR RECREATION AND BETTERMENT

By Mrs. Jessie Field Shambaugh, *who needs little introduction to country audiences, as the woman who, as a county school superintendent in Iowa, undertook and successfully accomplished the vitalizing of the rural schools, linking them up with farm life. Later she organized farm girl clubs throughout the country. Always she has made the greater welfare of the rural community her particular goal. In this article she has been asked to suggest, in terms of real farm needs and possibilities an answer to the question: What have we to take the place of the husking and spelling bees, the straw rides, the barn raisings and the other community frolics of earlier days?* —Editor.

Good times in the country. There is a wonderful chance for good times in the country. All around are the real things that alone can make true enjoyment—the beauty of sky and clouds and flowers and country roads; neighbors whom we know; the call to work which makes it fun to play when the work is done; and the simplicity and freedom of genuine friendliness.

Each should contribute his share. But we must all plan carefully and unselfishly, if we would make the most of this chance; for everyone—fathers and mothers, boys and girls, grandparents, and the hired help—has a

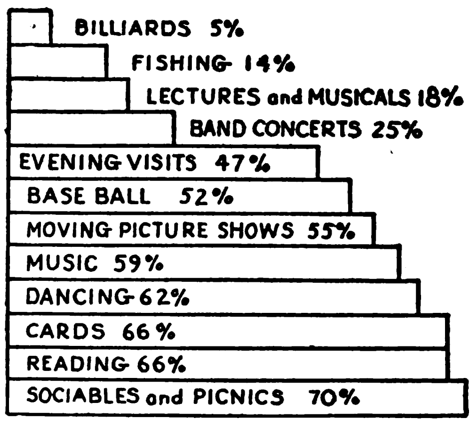


Fig. 265. Different forms of recreation and the percentages of the families in one rural township that partake of them. (University of Minnesota survey.)

part in the right kind of good times in the country. Each can contribute his or her share to the merriment of the community. Not one will be forgotten by the wise leader. The chance for expression by all is the ideal.

FIG. 266. What is going to take the place of the husking bee in rural community life?

A fine old legend. Only on unselfish reciprocity, can the recreation of a community be firmly founded. Very much to the point here is the old, old legend of how the city of Jerusalem was founded. The legend runs that 2 brothers lived side by side. The elder brother had many acres and the younger brother but few. Harvest time came. The younger brother looked at his field and said: "I have an abundant harvest, but I have so few acres I could use it all myself. But there is my elder brother; though he has many acres, he has a large family and he might need more." So, when night came, the younger brother took sheaves of wheat in his arms and put them on the edge of his brother's field. Now the elder brother also looked at his field and said: "I have an abundant harvest and, to be sure, with my large family to care for, I could use it all myself; but there is my younger brother. I have always felt that I wanted to do things for him, and he might not have quite enough from his few acres for his needs." So, when night came, the elder brother took sheaves of wheat and put them on his younger brother's field. They did the same thing on the second night; and on the third night they met each other on the edge of the fields with sheaves of wheat in their arms. And it is said that this is where the city of Jerusalem was founded.

So, at the very basis of all planning for entertainments and recreation in a country community, is the remembrance that every one has something to bring. Every community has resources, in people and in material things, waiting to be used; it would help every community to take thought of what these may be.

A community swimming hole. A man was planning to make an irrigation reservoir for his orange ranch in southern California. His daughter, who had been away at school, said, "Father, would it be much trouble to make it shallower at one end and put some cement steps in there? And then it can be a swimming pool, too!" The father laughed. "Why, no, that's not much extra trouble or expense. I'll do it." And now, each summer, down the dusty roads for miles, on hot days, come boys and girls and grown-up folks for a swim.

A pastor who loved boys. In a country neighborhood in Ohio, there was no place for the boys to get together where they wouldn't need to be bothered with the fear of hurting the furniture or something else, until a live young pastor, who loved boys, discovered an unused loft in an old mill, which the owner gladly let the boys have and which, with the help of the minister, they fixed up just to suit boy taste.

Sheltering groves and green pastures. A farmer in Iowa planted a grove when he became a homesteader, for he thought how people love groves for picnics and good times in a prairie country. Always that grove was free for use for picnics and celebrations; and the beauty of the trees and the spirit of welcome and hospitality in the heart of the man who owned the grove combined to make all the good times there long to be remembered.

Pastures are fine places for a baseball diamond, and yards are large enough in the country for a volley ball and tennis court. Stretches of native timber, where wild flowers grow and birds come to nest, should be carefully preserved in every community for children and children's children to enjoy.

Home, the greatest resource of all. But the greatest resource of all, and the one most often neglected in our thoughts these days, is our home. A country home with doors that open wide, with music and gladness within, where young and old love to come and are always welcome, where there is never any "fuss" over company, but where everyone feels the warm glow of "being at home"—this is the greatest asset of the community, when we plan for the very happiest times.

Learning to work together. There are so many things right around us that we can use for good times in the country to-day, and, best of all, there is that neighborliness which makes it possible to develop the spirit of working together for the good of all which is the secret of all lasting joy. It's when neighbors come together to do something outside their own personal interests that there is real fun. The churchyard needs to be cleaned and flowers planted in it; a bad place in the road must be worked; or a neighbor is sick and his crops aren't yet in. Here is the opportunity to get together and do the work,

with a picnic dinner at noon, and a glow in hearts when it is done.

A neighborhood porch. In a South Carolina country-school district, the people decided they would like to have a big porch built on their schoolhouse, where they could have socials and lectures and from which they could watch the young people play basketball out on their court in the schoolyard. One mother, who saw far, thought that getting this porch built could be made into a good time. So every one helped. They even cut the trees for the great rough posts at the corners. It is a very nice porch. It belongs to every one, for every one helped some way in building it; and though they have had it 3 years now, and the floor begins to look worn from the many feet that have walked over it, they all still talk about the good time they had building it and what a jubilee there was when they dedicated it. Around two sides of this porch they are now planting a "celebrity garden," and they have written to some of the great men and women whom they specially admire, asking them what is their favorite flower and planting it. It is a unique garden, with everything in it, from sunflowers to Senator Tillman's roses, and is most interesting.

Four acres for war orphans. Another rural community set aside four acres near its consolidated school grounds to farm together, the proceeds to be used for helping French war orphans to have enough to eat. There are so many things to be done together in the world, and it is such a pleasure to do them. Perhaps this very spirit of true friendliness, of glad uniting in a common cause, is the greatest of all things that the people who live in country places have to bring to the world—a world which is seeking restlessly the way to human brotherhood.

Activities of many kinds. In planning socials, entertainments, and "get-together" times of all sorts, it is necessary to remember what it is that all people are wanting—friends, something to think about, something to laugh over, something to do, something to satisfy that longing for excitement, variety, companionship, and a knowledge of the beautiful which is in every heart.

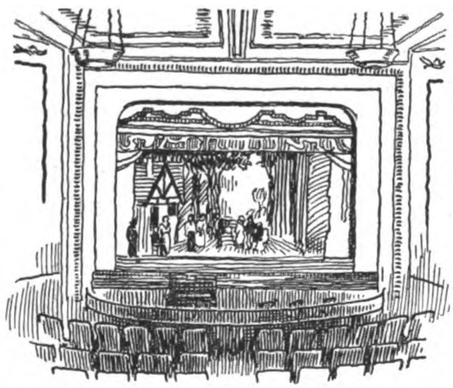


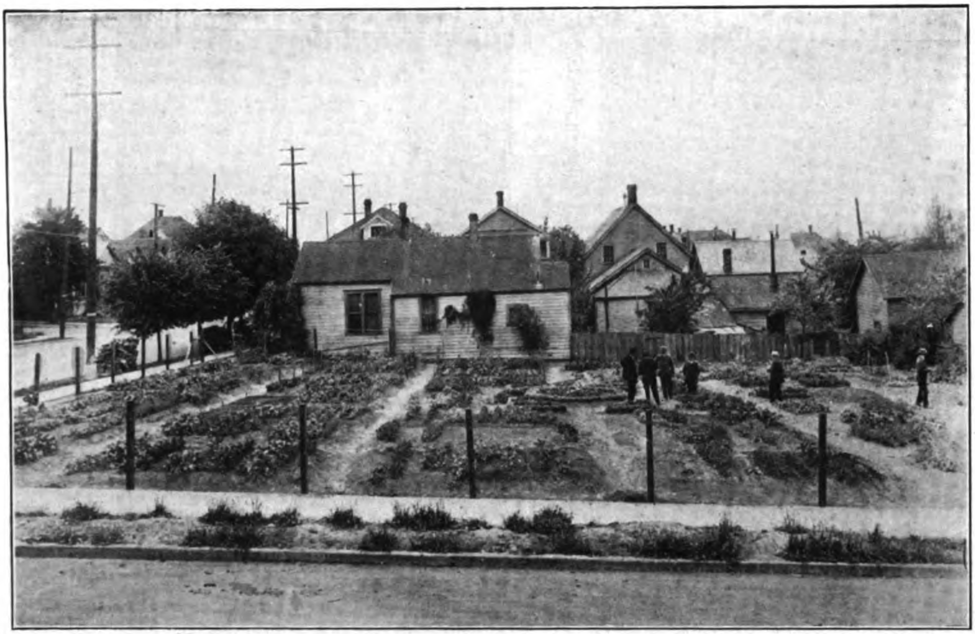
FIG. 267. The stage and auditorium of a municipal building in a Wisconsin rural county seat showing local artists preparing for a community play. (Wisconsin Bulletin 234.)

By entering thoroughly into our work in the country, and studying all that is back of what we do, a lot of pleasure can come to us in our everyday tasks. There is excitement in finding a good seed ear of corn and taking it to a corn show. A mother spoke truly when she said: "Since my boys have been studying about the best ways of farming, the rows are shorter for them, and I always hear them whistling as they come in from work." A girl will sing as she helps with the work of her home, if she enters into that work with her heart as well as with her hands; for it is the greatest joy to do things for the people we love.

So the country people of to-day have lots of good "get-together" times for this purpose of putting a lot of sunshine and interest and joy into everyday work, and every up-to-date farmer and his whole family have a part in them. The farmers' institute, or other meeting, brings its expert speakers, its chance for discussion, its exhibit, and its opportunities for the people to see one another and to sing together; and it's a big chance, too, to let the boys and girls have a part with reading, spelling, or ciphering contests, junior corn shows, bread baking, corn judging or stringing, and various other judging contests, colt shows, and the like. In many places, plowing contests have grown very popular in connection with these farmers' meetings.

Some communities are fortunate enough to have a short course in agriculture and home economics, lasting two weeks or more, with the best kind of teachers; and all states have a "Farmers' Week" during the winter at the state colleges of agriculture. There are counties which have camps for country boys and girls, under fine leadership, where the young people can study and have good times, and come home more proud than ever that they are from the country, because they know more of the opportunities there. Years ago, S. M. Jordan, of Missouri, saw the possibilities in a farm boys' encampment. Also, in many states there are state camps for boys and girls at the state fairs, where young people from all the counties in the state go. Then there's the county fair, which is not always all that it might be, but which country people themselves can make into a happy and helpful event with clean amusements and worth-while exhibits.

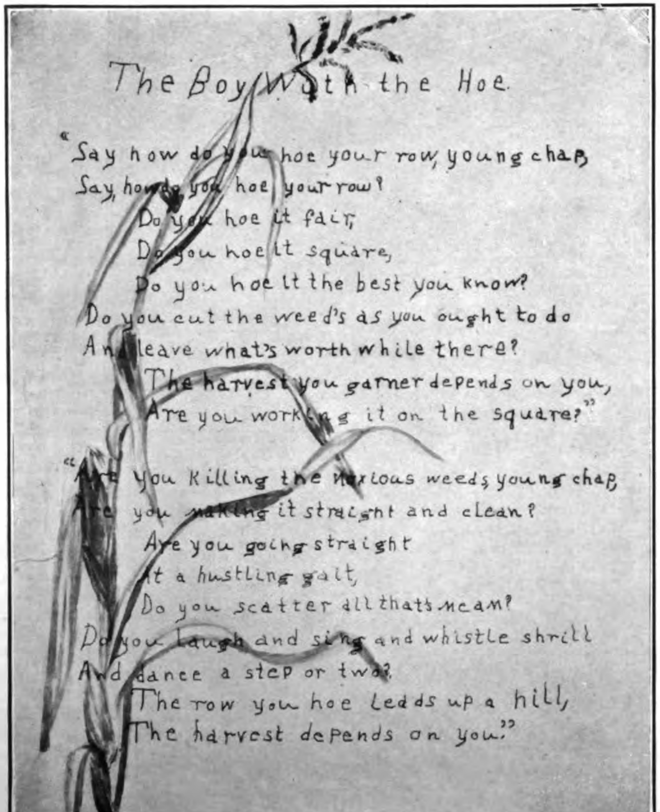
Touring one's own county. In a county in Pennsylvania, the Farm Improvement Bureau plans each year an automobile trip to visit all places and objects of interest to farm-



A boys' and girls' garden in Oregon showing what club work and enthusiasm did, in sixty days, to an ugly, useless backyard

An exhibit in a farm boys' and girls' pageant and play festival

THE NEED OF THE CHILD ON THE FARM TO HAVE ITS ENERGIES GUIDED AND ENCOURAGED IS SPLENDIDLY MET BY CLUB-WORK. (Office of Extension Work, U. S. Dept. of Agriculture)



This poem was part of a booklet on "How I made my Crop," submitted by a prize winner in a Corn Club show

The boy who wrote the poem; and who, incidentally, made 150 bushels of corn on an acre

The exhibit made by the 1915 Minnesota Potato Club Champion

"THE CLUB BOY WITH THE HOE" IS THE GAINER NOT ONLY BY HIS CROP BUT ALSO BY A LONG STEP TOWARD A BROADER, DEEPER, MORE USEFUL MANHOOD. (Office of Extension Work, U. S. Dept. of Agr.)

ers—fine stock, new alfalfa fields, modern farm buildings, etc.,—near by; and hundreds of automobile loads go and enjoy seeing things together and they have a picnic dinner at noon. Entering into all these good times with enthusiasm brings not only pleasure at the time, but added pleasure in one's work afterwards.

Chautauquas and motion pictures. There is much of interest in the things that are connected with work on the farm; but now, more than ever before, country folks are called on to be world-wide in their interests. So there are Chautauquas, with their speakers on all subjects of current interest; and these and lecture courses, also, offer the opportunity to hear good music and see good pictures. Many of us are within reach of good moving pictures, and the best films offer much interest and diversion. Some country communities have put moving-picture machines in the auditoriums of their school buildings, and have a good film shown once a week or oftener. Films can be secured from the United States Department of Agriculture and, in many states, from the State Commission on Visual Education.

Guideposts along the way. Then there is all the world of friends and interest and romance to be found in books and magazines, which come right to our doors in these days. Reading circles, using some fine course, such as the Chautauqua system offers, or following the reading courses recommended by the United States Bureau of Education, for the completion of which certificates are offered, are worth while. The Young Women's Christian Association has a printed list of books and poems that country girls like, for which a beautiful bookmark is awarded as recognition when the books have been read and the poems memorized. County and state librarians are always glad to recommend reading for any club or group of country people. Free libraries, either traveling or local, are almost always available.

Pay in play. But it is not only things to think about, but things to do, things that work muscles as well as brains, that young people especially desire and need; and there is no surer way to help boys and girls to grow pure and good than to give them plenty of athletics and active exercise out of doors. The National Playground and Recreation Society of America, with headquarters in New York, furnishes some very helpful material along this line, including a "Standard Athletic Badge Test" for boys and for girls, for which they award a small bronze medal. The test requires very little apparatus, and can be easily undergone by the boys and girls in any country neighborhood.

Field meets for both boys and girls should be encouraged, locally and in townships and in the country. Team athletics, such as basketball, volley ball and baseball, are always good. Folk games out of doors with music, and all sorts of games, such as are described in Jessie Bancroft's book on "Plays and Games without Apparatus," are desirable. Hikes, swimming, riding, automobiling, fishing, hay rides, picnics, corn huskings, and all sorts of active good times together are right, and should be available for every one, but especially for the young people. Boys and girls should grow up used to having good times with one another in crowds under right leadership.

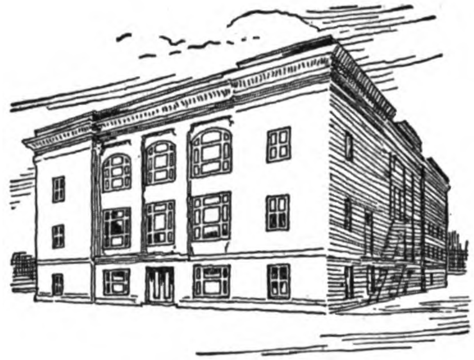


FIG. 268. The municipal building of which the theatre is shown in Fig. 267. It contains also offices for the city officials, a suite of assembly, dining, rest and other social rooms under the control of the local Woman's Federated Clubs, and the quarters of the Men's Commercial Club. It is a real community center. (Wis. Bulletin 234.)

Pageants and community plays. Pageants are among the recent forms of community expression. These are a form of drama or play in which many people take part, and there is more in the music and the color and the action than there is in the words. Usually, pageants are given out of doors in some beautiful setting of trees and flowers. Many communities have written and given successfully local historical pageants, showing the development of the place from the earliest times, and closing with a tableau or prophecy as to its future. It is a chance to give credit to those who have helped in the hard pioneer times of the community and to bring to mind the traditions which are cherished. Inexpensive collections of pageants suitable for giving in country communities are available, but the best plan is to have the pageant written locally.

The National Anti-Tuberculosis Society has printed for free distribution a very interesting series of "Health Playlets," which may be effectively given by the children of a community. A student in a state college of agriculture has written a play entitled "Back to the Farm," which gives in a clever, entertaining way much of the philosophy of scientific farming.

A well-written dramatization of some book or poem by a person living in the neighbor-

hood might serve to illustrate the value of the play as an expression of the life of the community, but plays and dramas by great authors should be selected also. If performed out of doors, they can be given in the afternoon or, if plans can be made for the lighting, in the evening.

Community Christmas trees and carols. Community Christmas trees are as successful in country neighborhoods as in cities and towns. They can be set either out of doors, in the schoolyard, churchyard, or Grange-hall yard, or inside, as may seem best. If there are no electric lights available, pretty decorations and a procession of children with Japanese lanterns on long poles add to the beauty of the event. There need not be presents on the community Christmas tree; but the spirit of love and joy should be shown in abundance, and everyone should be remembered and given a chance to see the tree. Owners of automobiles should take the carol singers to sing to such old or sick people as could not come.

"Get-together" dinners. A community dinner once a year, preferably in the spring, in order to welcome the new tenants just after they have moved in, is the custom in some country neighborhoods. Events recognizing family relationships are pleasant, too. The girls in a country place in Kansas gave a party for their fathers. Mother-and-daughter banquets, father-and-son banquets, parties for grandmothers and for little brothers and sisters are popular in many country places.

Good times and good friends. It is very certain that whatever really good times people enjoy anywhere may be enjoyed at their best in the country; and no people deserve good times more or know how to enter into them better than country folk. And to-day, with better roads, swifter means of travel, more modern homes, with the masterpieces of music, art, and literature within our reach, with the most noted speakers coming near enough for us to hear them, and with the beauty of God's world all around us, everyone who lives in the country should have the opportunity of a real good time.

And with it all there must come that love for our neighbors which makes for eternal happiness. A farmer who had lived for many years in one community said near the end of his life: "I think I love everyone in the world—but, especially I love the people that live from Xenia to Cassar Creek." To love those who live around us as much as we love ourselves—this is the great secret of good times in the country.

THE COMMUNITY LIBRARY

By EVELINE WARNER BRAINERD, *who was born on a Connecticut farm which she now owns and manages, and who is also a trained librarian. Volumes have been written about the ability of books to enrich human lives; but that they may do so they must be within reach. Many farm communities are fortunate enough to center around a village or be within reach of a town in which a library can be or already has been established. That it may make best use of such an opportunity, a community should know something of the workings and needs of a library, something of how to enlarge and improve it. These matters Miss Brainerd discusses out of her own experience as well as the accumulated knowledge of others.*—EDITOR.

UNLESS we include the various small collections of books found in rural schools, there are comparatively few libraries in the open country. We must, therefore, confine the present discussion to libraries in villages and small towns, excluding the deposit stations, or traveling libraries, operated by county libraries, which are treated in a separate article, below, on "Rural-Library Extension."

The best recipe for a village library, or indeed for any library, is that given by John Cotton Dana, head of a widely useful public library. He says: "Get a room, a flat-top desk, a plain bookcase, and a real librarian."

The room or building. Considering the room first—though, as a matter of fact, it is the least important, if most prominent, feature—how is the library to be started? The whole tendency to-day is toward the free library. This can be arranged by town action. The town votes a sum of money for the library and appoints a board. In most, if not all, states, the town-owned library has certain advantages. The state often grants it a sum each year for books, to be chosen from the excellent state lists. The disadvantage is that local politics may enter into the library management.

The Carnegie plan is to make a gift of the building, dependent, however, upon the raising by the community of an equal sum of money for the endowment. A building should never be accepted by a town or board of trustees without an assured endowment from some source; else, those responsible are likely to find themselves saddled with the upkeep of a costly building with no money for books or librarian.

If there be in the locality any historic or picturesque building, which refitted can serve conveniently as a library, all effort should be made to use it, even at the loss of a much more pretentious new structure. If, however, a new building is to be put up, make it fireproof, if possible; at least, make the stackroom fireproof.

Arrangement and equipment. The stacks, in any case, should be "skeleton," with cases of metal, not wood, as wooden ones hold dust and take up undue space and light. The woodwork of the building should be plain and easily cleaned; and careful attention should be given to heating, ventilation, and lighting.

There should be a children's reading room with high tables and chairs, as well as the low ones which are a matter of course. Quite often children grow beyond the size of small furniture before they are too mature for juvenile books. Where space is sufficient, other special reading rooms may be provided. All furniture should be plain, well-built, and comfortable. If the village already has a public hall that can be fitted with stage and footlights, it would be foolish to include one in the library building; but, in cases where there is no such opportunity for the young people to give plays and concerts, and for the delivery of lectures, a room with a stage or platform is a valuable addition to the library. However, the true value of a library should be in its books and in the suitable arrangements for getting at them and reading them.

The librarian. Certain traits of character and training are necessary to make a good librarian. For a small library, say, of less than 5000 books, a technically trained librarian is not necessary, although, other things being equal, one is always to be preferred. In any case, a trained cataloguer must be had to arrange the first books, start the catalogue, and plan the charging system. While the readers number under 100, the old-fashioned record book, supplemented by the librarian's memory, may be sufficient; but it is far better to begin with one of the card or slip systems. The Dewey system of classification is used throughout the country and is the best method thus far invented for keeping a growing collection classified, although the cataloguer should know how to simplify it for a small collection.

A librarian must, however, be more than a cataloguer. She should, to be sure, have a strong sense of order and system, and should write a clear hand, or, if not capable of this, should use the typewriter correctly. Besides possessing these accomplishments, she must enjoy helping people, and she must read books and love books, not alone her particular favorites, but all sorts of books; else, she will never know her library, and, if she does not know it, she can never direct readers.

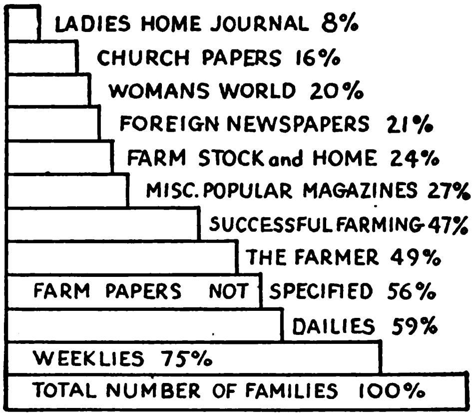


FIG. 269. What the families in one rural township read. From a survey made by the University of Minnesota

Valuable old papers and books. The librarian should be on the watch for the dismantling of old houses and see to it, if possible, that no attic collections of old papers and books are destroyed without being examined. In the most out-of-the-way corners may be found treasures which, if not valuable for her own library, may be given to the state or college collections, or sold to dealers for the benefit of the local book fund.

Where to buy books. In purchasing books, use, if possible, some local dealer, but if, because he is a small dealer, discount be small and delays long, search must be made among the larger book stores for better service. The library discount is now very small at best; and though, in some cases, better prices might be secured by ordering books from the publishers direct, the inconvenience of this and the extra cost in postage and express charges, makes the general book store the better market. If the store chosen takes magazine subscriptions, all those for library magazines can be renewed at one time, which will save much

FIG. 270. A central county public library in a thriving California farm community which typifies the wealth of the surrounding farms and the intelligence and progress of their owners.

delay. As to magazines, it is well to find out which of them are regularly subscribed for by the families which your library is to serve, and then to choose others.

What the first selection of books should include. The first selection of books requires much thought. It must be sufficiently attractive to win readers and supporters for the new enterprise; it must be a foundation on which to build further, and, because it is an experiment, it must have considerable variety, in order to serve as a test for future collections. It is well to decide on the number of books which shall be purchased as a starter, say 100, and to divide these up among the different fields—fiction, science, history, and biography.

What reference books to buy. Certain reference books are necessary. Make out a list of these; find out which are possessed by individuals in the community; and buy the others. In this way, you may, perhaps, postpone the purchase of a large dictionary and buy an agricultural or a general cyclopedia. Keep your original list of reference books needed, and to every purchase of general reading matter, try to add one reference work until you have a sufficient number of these for your community needs.

Books must cover the field. Do not overlook any interest or activity in your neighborhood. First of all in importance are sound books on agriculture, domestic science, and home hygiene. Then the Sunday-school teachers may stand in need of certain books; or the district-school collection may show many gaps which the teacher would like to have filled. According as the region is one where minerals, timber, oil, or special crops abound, choose your collections in a way to make local history and conditions more comprehensible and interesting. Remember the foreigners, too, who are present among you.

Books on present-day problems. In choosing histories, buy the shorter and more popular; and purchase, also, books which discuss authoritatively present-day problems, such as social welfare, labor questions, and foreign relations.

Remember the children. Make "juveniles" a large proportion of the first purchase. This is not often done in the opening of a small library; but, if the children of the community be attracted, the welfare of the library will be almost assured. Put money into well-illustrated books for children. Give the little folks fairy stories, legends, hero tales, simple biographies, adventurous history, natural history, mechanics, and elementary science—above all, the agriculture of their own farms. These must all be illustrated.

The publication of children's books has become a great commercial enterprise, and their wise purchase calls for careful discrimination. Never buy the new books for children till some responsible person has read them. Many good-looking books turned out each year, published, perhaps, by good firms and bearing on their covers the names of great organizations, are worthless trash, untrue to life, questionable in morals, and written in poor English. There are not many children's magazines, and most of these are expensive. However, there are a few of much merit and well worth what they cost.

About binding. Binding is expensive. Try several binders, and compare their work and prices, before sending out any great number of magazines or volumes. The remark may sound strange, but the magazines best worth binding are usually the children's, because children have the habit of reading and re-reading their favorite stories innumerable times, whereas grown-ups hasten on to new things.

How to attract and interest readers. With the library complete—rooms, librarian, books—how shall we attract the readers? This can be done only by advertising—not by large headlines in the newspapers, because different wares require different methods to introduce them, and the library is not a dry-goods store; but it is done by publicity, all the same. Reading notices in the papers about new books just in, or about books on certain topics of immediate interest, or appealing to certain classes in the community, are useful; one library had a most effective card for older boys and girls, explaining the use in one's career of such increased knowledge of one's work as books offer. Once a year there should be a public library meeting, at which the work of the library for the year is explained, its interesting features made much of, and its aims clearly shown. Here would be an opportunity for an address on some book topic by an outsider. But all such programs, if they are to be profitable, must be alive and connect up with the life of the community.

Within the library itself, much may be done to broaden its reach. First, the bulletin board must be kept varied and up to date. It must call attention to the new books as they come in. It must make mention of all gifts of books and their donors. It must

advertise books on current topics. Then all new books (save reference, fiction, and juveniles) and, of course, rare or costly volumes, should be placed for a time between book-holders on the tables in the reading room. In one small library, this experiment was tried, with the result that a dozen serious books on questions of the day were found at the end of a few months to be nearly as shabby from constant use as the most popular novel.

Story hour and oral book review. The story hour has long been a means of gathering children at the library and interesting them in worth-while literature. The same idea is behind the oral book review, in which the librarian, or some one else acquainted with the subject, gives an informal talk on the latest books purchased, on some special collection in the library, or on some special topic dealt with in a book. It takes much ability and effort to make known the practical value of books, or even to convince people of the pleasure there is in reading; but if the library does not succeed in some measure in thus impressing its community, it has failed in part of its task. This thought brings us back to Mr. Dana's recipe. Whatever your library goes without, don't let it lack a "real librarian."

RURAL LIBRARY EXTENSION

By MARY EMOGENE HAZELTINE, *Preceptor of the Library School of the University of Wisconsin and supervisor of the public libraries of that state since 1906. She was born in western New York and has always kept in close touch with farm conditions. After graduating from Wellesley College in Massachusetts, she taught for two years in the Killingly township High School in Connecticut, gaining there a further knowledge of rural communities. From 1894 to 1906 she was librarian of the James Prendergast Free Library of Jamestown, N. Y., in which capacity she came in touch with the rural library situation in that state. With Wisconsin essentially an agricultural state, her present work has to do largely with library problems of the small towns and the open country, and requires a constant familiarity with rural library development throughout the country.* —EDITOR.

THE present-day hope, with its partial fulfillment, of a book from a free library for every rural dweller, marks a long stretch of time from the monastic libraries of the Middle Ages, where books were closely guarded for the use of priests and monks, and from the great university libraries of later centuries, where books were hoarded for scholars and the nobility, to the free lending libraries of American cities and towns, where books are provided for the free use of all residents.

Origin of modern public-library movement. The modern public-library movement began in our cities about 1876. To-day, almost every city and town throughout the country has its free library, well-organized and well-administered, where any of its citizens, of whatever age or estate, may borrow a book or a magazine for home reading, or may secure information on any desired subject from the books in the library through the aid of its trained workers. Almost immediately it was recognized that books did not belong exclusively to dwellers in cities and towns, but to the entire population, rural as well as urban. To aid in solving the problem of making free books available to all the people, state aid and supervision were naturally sought, following the method of the public schools, which have attained their wide and successful operation through state support.

FIG. 271. This is the kind of community to which the traveling library carries comfort, encouragement and new ideas.

Massachusetts was the first state to establish (in 1890) a library commission, which was "authorized to grant to any town, upon the establishment of a free public library, $100 in

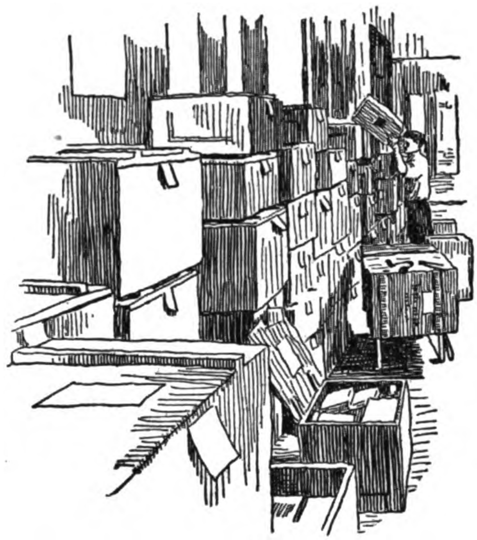


FIG. 272. Packing and shipping room of a state extension library

books." New Hampshire followed (in 1891) with a similar law. In 1892, New York developed a complete system of state supervision of libraries, and was the first state to establish traveling libraries, the distribution of these beginning in the following year.

This plan of supervision for better library development, for higher standards of service, and for library extension to the entire population, was followed by other states, until, in 1917, no fewer than 37 states were undertaking library extension work, either through a state library commission or through the state library itself.

Although the organization and methods of the several states differ materially, the common aim is to encourage the establishment of libraries in all communities able to support them, to promote the efficiency of libraries already established, and (in 30 states) to maintain a system of traveling libraries for the rural population. In spite of the fact that statistics show a great increase in the number of books in traveling libraries, a careful study of conditions in rural communities indicates that many millions of people either are not reached by these libraries or do not understand that they have these privileges.

A book for everyone in the state. It is a great problem for the state to reach out from its capital city with a book to every individual within its borders. While the state traveling library has done much in the years since 1892 to give everyone within the state boundaries the right book for his need or his pleasure, the very extent of the field has revealed its limitations. Consequently, a smaller unit, following the existing political organization, has been tried.

The first county libraries were established in Ohio in 1898, and the movement has spread from state to state, until to-day 15 states have passed laws authorizing county library work in one form or another. The county commissioners or other governing body may contract with an existing city library to extend its privileges to the whole county in return for a definite annual appropriation, or a new county library, supported by a tax levied on the whole county, may be created. The system has been very fully worked out in California, where a large majority of counties have well-developed county libraries reaching every part of their large districts.

In parts of Indiana and Iowa, the township has proved to be the better unit of organization, and occasionally several townships have united in supporting one library. In any case, the smaller field, whether township or county, makes possible a more personal contact between librarians and readers, and cuts down the shipping distance.

The county library and its aim. The fully organized county library aims to make books accessible to every reader or potential reader within its boundaries. Its distributing agencies are branch libraries with reading rooms in the larger towns and deposit stations or traveling libraries in the rural dis-

tricts, placed in the schools, in the village stores, and in the post offices. These small collections are made up to suit the type of community to which they are sent, are changed at frequent intervals, and are supplemented by a delivery service from the central library, which brings any particular book that may be desired. Isolated farmhouses may deal directly with the central library, receiving by parcel post a book ordered by post card or over the telephone. A collection of books from which to choose may actually be brought to the door by a book wagon, driven by one who cares both for books and for people, or, in up-to-date fashion, by a book auto. This latter makes trips on a regular schedule, interrupted only occasionally by impassable roads. Though this house-to-house delivery in rural districts is not yet common, it has passed the experimental stage, having been used in Washington County, Maryland, since 1901, and, more recently, in the Middle West, especially in Indiana. On a trip to the county seat, the library is one of the places to be visited, the farmer receiving the same service as the city resident, while the county teachers' association and other county organizations may meet in its auditorium.

FIG. 273. A traveling library in a country store. After a certain period these books are sent elsewhere and replaced by others.

The development of the idea of library extension, together with the working out of practical methods for carrying it into effect, has not been an isolated movement. Through the West, the women's clubs have been an active factor in supporting and even in initiating library service, several state federations having operated traveling library systems of their own before state library systems were established. The state and county fairs have given the opportunity for widespread publicity concerning the use of the books. The parcel-post system, good roads, and inexpensive automobiles have made the rural districts accessible. The centralized country school, with the many clubs growing up around it, is becoming a library center of distribution, not only for children, but for all classes and ages. So library extension will advance and perfect itself as rural communities develop.

Farmers not alive to their privileges. It would seem that a movement which has been developing since 1892, with the state to support it and librarians eager to push it, would have advanced more rapidly, especially in the

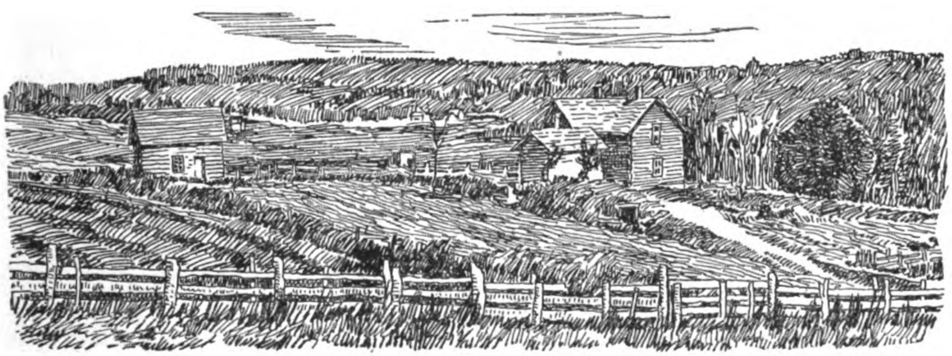


FIG. 274. Modern library extension work sends books by parcel post even to such isolated farm homes as this. Thus are farm folk held closer together and closer in touch with the advantages of more thickly settled communities

FIG. 275. The book wagon or traveling library is no longer an experiment in several states. It is simply an adaptation of extension methods to library aims.

last decade. It is safe to say that the trouble is largely with the farmer himself, who has not understood that he has these opportunities. Busy with practical affairs and the long day's work, he has not hitched his farm to a book, nor has his wife so hitched her home, while both have failed to appreciate the recreation that comes through reading. Besides, up-to-date books are among the potent means of helping to keep the boys and girls on the farm.

How he can get and use library privileges. With the experience that 25 years of rural-library extension affords, and the laws already on the statutes in many states, farm dwellers should be able to advance the cause to such a degree that the next decade shall show every country district as well supplied with free reading matter as the city precincts. This can be done if every farmer will study his state library law. County library privileges should also be investigated. When he has learnt what the law allows and what has actually been provided in his own state and county, let no farmer fail to utilize the service to the fullest extent. Books should be borrowed for all the family —"Mother Goose," to read to the baby; picture books for the youngest children and books to read to them; easy books and fairy tales for the children beginning to read for themselves; books of adventure and travel and good stories for the growing boy and girl; all kinds of books for the farmer and his wife, from tales of everyday affairs to accounts of the world beyond the sky line; and even a large-print edition of an old favorite for grandmother.

Having discovered and utilized these privileges, the news should be spread among the neighbors, at Grange meetings, in church, at fairs, in schools and neighborhood centers, wherever a word can be spoken. Personal recommendations and approval are the largest factors in modern publicity.

If, on searching for state and county laws, it is found either that they do not exist or are inadequate, the farmer should undertake, through the proper channels, to see that bills are drawn and legislation enacted that will bring library extension to his state. Or, if the laws are already made, but lack sufficient appropriation to render them effective, the necessary financial support should be authorized. If county or township service seems best for his locality, the county or town board should be approached with enough backing to prove the importance of the movement and a willingness to support it by the slight increase it would mean in taxation.

FIG. 276. This library is part of the traveling equipment of a progressive county agent who knows what it means to an isolated farm family to be kept in touch with the interests of the world outside.

On the other hand, if he finds the laws ample, but the service poor, the matter should be followed up until improvement comes. It should be remembered that service is generally coördinated with local demand and patronage. The farmer should ask for the books he wants, and should expect good service,

even delivery at his very door. He should know the authorities from whom to ask advice about books and reading, and for information and help on any subject. Further, he should demand that rural libraries, both as to books and the personal aid of the librarian, keep abreast in their development with libraries elsewhere. The farmer should be able to supply his book needs as easily as the town man who lives on the same street with the library. Let such library service be the slogan of all who live in the country.

COMMUNITY MUSIC

By EVELINE WARNER BRAINERD, *who has taken an active part in all phases of community development. Love for music and the ability to create it, even among the peasant classes of a country, seem to be national characteristics of the Old World rather than of the New. For our part, the fact that we have no peasant class may account for this lack. Another may be the comparative youthfulness of our country, since folk music usually needs centuries in which to grow and ripen. Nevertheless, Americans do enjoy music, and given the necessary impetus and instruction, can make and fully enjoy it. Some of this stimulus is given by Miss Brainerd in the following discussion.*—EDITOR.

ONE of the great advantages of the country over the city is that all the interesting things are not done for one in the country; one has to take a part in the doing of them.

Community music should rank among the first of the many activities that grow up naturally in the country or in which it is comparatively easy to create interest. The real spirit of community music lies in the work of the people themselves, rather than in that of hired performers. The name may be new, but the idea is old.

The old singing school. Two generations ago a simple yet worth-while form of community music flourished in our country districts. This was the winter singing school. A teacher was hired, and paid a small fee representing contributions from each member; any one could join; and the whole village came and sang. This was before organs and pianos were common in the country, so the teacher carried his tuning fork from village to village.

The village band. Another form of community music is the village band. Although such bands, with their limited memberships, are a little more like clubs than some other community organizations, they are, nevertheless, fine examples of community spirit. They are organized primarily for serving at neighborhood functions, and usually for love of the work and because of pride in their village. The United States, though, is not a musical land. It ought to be. Music brings good cheer and a neighborly spirit. There is no more restful, more uplifting recreation. It is not, as we too often think, a luxury, but really a part of life, when we take the broadest view of what life should be and may become. To leave it out means not only that we miss a personal pleasure, but, also, that we have thrown away a great power for good, for social purification, and for happiness. There is probably nothing that serves so effectively to bind neighbors and groups and to give them a sense of good fellowship as music which they have made together. The church knows this and has always paid great attention to its singing.

Soldiers should sing. The army knows the value of music, and every training camp now has its instructor to teach and lead in singing. Formerly, before the World War brought new ideas and methods, thousands of men for the most part whistled as they marched, not because they did not like to sing, but because they knew no songs.

Americans and music. If America may not be classed as a musical country, yet many Americans love music. Each year vast sums are spent on the

operas and concerts in the large cities. Valuable as these are for the people who have the opportunity to enjoy them, they do not meet the great need of the country. Parents who make sacrifices to give their daughters music lessons, understand the desire and need we have for music in our homes. Often, however, these daughters are not able to learn to play enjoyably. Still the daughter who is not a pianist may, perhaps, become a good singer, and may heartily enjoy taking her part in a chorus. She may even take a new interest in piano playing, if "pieces" are no longer demanded from her, but merely accompaniments to the songs and hymns which the family and neighbors like to sing.

What the singing of old German chorals did. The chorus is the simplest and most important form which community music can take. Almost every one enjoys the realization that his voice is a part in that volume of sound which rises majestically from the mass of singers. The first large chorus in this country to attract popular notice was one in Bethlehem, Pennsylvania. There, even in the days of Benjamin Franklin, an ancient Moravian church was famous for its singing. Twenty years ago, or less, a new organist came to this church. For centuries, the Moravians had been singing the glorious old German chorals, and these alone. The young musician was struck with the beauty of the music and the earnestness of the singers. From his church choir, grew the Bach festivals which have made Bethlehem famous, and have caused it to become a gathering place for musicians and music lovers at Christmas and Easter. Yet, wonderful as is the singing, the singers are only the men and women of the neighborhood singing the music they love.

Community singing in Connecticut. Up in the hills of Litchfield, Connecticut, where winters are harsh, roads rough and steep, and houses scattered, there is a broader, and so a better, working out of the community-music idea. This movement, which grew from some free, open-air concerts on Norfolk Green, has been aided through the generous support of two local music lovers. The Litchfield Choral Union takes in 5 towns. A musical director gives a weekly lesson in each during 3 months of the year. Anyone who can sing is welcome. From these 5 groups is chosen the chorus for the annual festival. One year, 416 voices were selected out of a total of 700. From a population of 800 in one village, 110 are in the class. Such is the interest that some members, whose homes are outside of the villages, walk 3 or 4 miles or drive 10, week after week, winter after winter. Although the festival has grown to be a musical event of real importance outside of Litchfield County, the real value of the Choral Union is the happiness which it has given to the 5 villages. It has brought together all sorts and conditions of people. Catholic and Protestant, employer and employed, college man and laborer, landowner and renter, all have been bound together in a happy endeavor, a friendly enjoyment, a common neighborhood pride.

Where the audience joined in. In a country place of 6,000 people, a musician offered to train in singing as many people as would come. The closing concert was to be free, and the members of the class were to contribute 50 cents each to cover the incidental expenses. The people came and they sang. And not only that: they interested so much those who did not come that when, at the festival, the words of the Bach motet were distributed, in order that the audience might follow, the audience not only followed, but joined in also. Great was the surprise and delight of the leader, who, more than he knew, had awakened the love of music in a secluded community.

Many states encourage the movement. The Middle West has done more than any other part of the country in using the musical material at hand. State colleges, notably at the universities of Wisconsin, Kansas, and Michigan, have been leaders in spreading the knowledge that the making of music is within the power of almost all of us, if we only go at it in the right way. In Illinois, there are many bands and orchestras, and Indiana has her festival choruses. Richmond, Indiana, has a chorus of many grown folks besides the school choruses; and there they have wisely solved the problem of the full community orchestra by having the rarely used instruments owned by the community.

Kansas a leader in community singing. Thanks to the Dean of the School of Fine Arts of the University of Kansas, any one fortu-

Fig. 277. An outdoor song service. Music is nowhere more impressive than in the out-of-doors

nate enough to live in that state has only to write to Lawrence, if in want of advice as to programs, Victrola records for "appreciation concerts," or even of an organizer. And the people of Kansas do send to Lawrence, and the reports of the work of town orchestras and town choruses throughout the state show what comes of that. These towns are all beginning in a small way, like one, for instance, that gathered the people first for an informal "sing" in the lighted courthouse yard, and distributed the words of a few well-known songs, on leaflets given by the town printer. At the next "sing," in marched the town band, and that was the beginning of success. Winfield is a good example of the Kansas methods. Music there began very naturally with a high-school orchestra and a chorus, the two combining once a year for a concert. The one concert grew into a series of performances. Then the pupils who had left the high school and the people who had never been there, wanted to share in the good times of the chorus and orchestra. It was found, too, that professionals were glad to give their services for something that belonged to everyone. So out of the school music clubs came the community music; came special programs for children; came orchestra training as a part of the public-school curriculum; and came to Winfield itself the prize offered by the Child Welfare Department of the University of Kansas for the best town for children in the state.

Two lads as leaders. It was the singing of two lads coming home late in the evenings that turned attention to singing in another village. There had been musicians among its people in other days, but these were gone. They had left behind them, however, as memorials, a fine church organ and a beautiful piano, but nobody who could sing. At least, that was what everyone said till some one began to think about those boys singing along the road in the darkness. It was decided that the youths should have a singing teacher, and they brought into the class a few of their friends. The second year, the class became a large one, drawing in many of the people from the surrounding country. It was surprising what a difference there was in the village celebrations after this work had been going on awhile. The Sunday school opened with a song service which made even the least interested "sit up." The children had learned the delight of singing together, and the feeble little pipings from distant corners were things of the past.

There was a Christmas tree on the green that year. It was not a very big village, and a good many houses stood empty in December after the summer visitors had fled. But there were plenty of people, big and little, to see the tree lighted. The old Christmas carols rang out, and there were more Merry Christmases spoken than Santa Claus had heard before. Besides that, the few sick people and old people were made happier by the sound of carols under their windows, as different groups of their neighbors paused on their way home to surprise them with the season's greeting.

This village singing club has thus far contented itself with such celebrations, and with making ready for an Old Home Day on the Fourth of July by presenting a program, not only of our own patriotic songs, but of those of the nations from which the settlers came, and of those of the foreigners now settled in the town. They hope, another year, to combine with other nearby villages that are beginning to pay attention to the voices of the boys and girls, and thus to have a concert in which the whole county will be interested. This does not mean that they are going to use themselves up on the festival, so that they will not be ready for the everyday pleasure of singing at the usual town gatherings. The members are pledged to stand always for community music, never permitting quartet or solo work to displace the work of the largest possible number of people. They are going to make people think of the music, not of the musicians. The festival gathers together singers from many scattered communities; it gives them something definite to work for; and it necessitates the thorough study of some great musical composition. But, in addition to this festival work, a community chorus should study folk songs, patriotic airs, and all music that fits in with daily life.

A hopeful field. Each neighborhood, however, must adapt to its own needs and circumstances what is to be learned from those who have made a beginning in this hopeful field.

FIG. 278. A community band made up entirely of farm boys. Such an organization can add to their pleasure as well as that of all the neighborhood.

It does not, of course, follow that one community can do just what some other has done. The big truth to bear in mind is that, under the right plan, community music is everywhere possible.

ORGANIZATIONS FOR RURAL COMMUNITY DEVELOPMENT

By MRS. HELEN JOHNSON KEYES, *who has personally taken part in or come in contact with most of the subjects she treats of. It is true that farmers have been slower to organize than most classes or groups of workers. But the peculiar and difficult conditions under which they work, make coöperation harder to bring about than in any other industry. Yet they have created and maintained some organizations that have attained considerable importance and extent. What these are, what they can do, and how their good effects can be increased by others are suggested here.*—EDITOR.

IN THE Colonial period, organization by farmers was occasional and temporary, chiefly for defense against Indians, or for the larger operations of agriculture, such as harvesting. Between 1869 and 1889, it existed mainly for the purpose of regulating, through politics, the business of other people, in order that monopolies and middlemen should not exploit the profits of the soil. Since 1889, it has assumed a somewhat new character, and, leaving politics to politicians, has bent its attention on its own business—not merely increased crop production, but buying, selling, storing, and transporting. Combined with these large economic programs, it has always had an educational and a social mission of great value, particularly in the small local units or clubs.

Local Associations

It is, in fact, these local associations which are doing the most effective work in making the countryside sociable and attractive. It might be said that they have in charge the educational and social life of the American farm, although the widespreading network of local and Federal government agencies now operating in the country has drawn to itself many of the tasks which were once performed by voluntary associations; consequently, these latter have become coöperating forces instead of pioneer influences. Their strength, however, is increased by this fact. It matters little whether they are only local or are local units of state or national organizations; in every case they exist for the purpose of making life in the home more efficient with less labor, and life in the community more attractive.

FIG. 279. A farmers' club demonstration meeting in the South. Social and educational activities are everywhere going hand in hand.

Farmers' clubs. So-called farmers' clubs include the entire family in their membership. They hold all-day sessions which are devoted to farming and farm-home problems, but are enlivened by music, recitations, debates, and dramatics by local or imported talent. The noon intermission is a great event, and includes a large dinner.

In most cases, each club is an entirely independent body; but in certain states, Michigan, for instance, the individual clubs are federated into the State Association of Farmers' Clubs. In 1908, no fewer than 120 clubs from 32 counties were included in this federation, with a membership of over 7,000. An annual state meeting of delegates is held.

Farm women's clubs. Farm women's clubs are strong influences in the new housekeeping and home-making. Many of them confine their programs almost entirely to housekeeping problems, the care of children, and the earning of pin money; others are more literary in their scope; and still others become travel clubs, assisted by the cheap prints of famous places, sold at a low price by publishing houses. Food is always an important part of the programs.

Boys' clubs. Boys' clubs are of value in turning to account the energies and talents of

youth, which are often wasted when not organized. Boys under 14 years of age need a young leader who inspires hero worship. A secret and a badge add greatly to the spirit of fellowship. The drafting of a constitution and the formal election of officers is a good lesson in government. The regular meetings should never be invaded by grown-ups; but the entertainments, debates, and athletics which are open to the public will welcome the coöperation of parents and friends, and may be mighty influences in promoting sympathy between 2 generations. So organized, the boys will enter heartily into community-improvement work.

Girls' clubs. Girls' clubs are of value in creating the good homemakers of the approaching generation. They put fun and pride into labor, and teach the joy and beauty of friendliness. Girls who have been members of these clubs will be better wives and mothers than they could have been without that training.

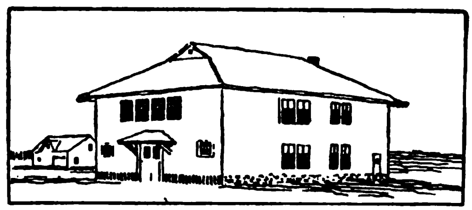
Young people's clubs. After boys and girls are 18 years of age, they can work together for all sorts of good things. Dramatics and pageants which illustrate local history can be staged by them, and exhibits of historic heirlooms have often promoted a local pride which has found expression in better home institutions and better citizenship.

Parent-teacher associations. Parent-teacher associations are doing a splendid work in bringing home and school into sympathy and coöperation. Every neighborhood ought to have one, and the mothers and fathers should meet with the teachers at least once a month during school term, and find out how they can help them. They should make the teachers welcome in their homes, and aid them in becoming familiar with the work and problems which the children encounter out of school. Neither home without school nor school without home can educate children. The two must join hands with the children in the center.

National Organizations with Local Units

The Grange, or the Patrons of Husbandry. The Grange is a great national secret order. We know and love it best in its local groups, called "Subordinate Granges"; for these are community associations, made up of men, women, and young people over 14 years of age, who live in the same township or within a radius of 5 or 6 miles of one another. They are naturally bound together by a oneness of interest; for, to a great extent, they are all doing the same kind of farming, living in the same kind of home, and seeking the same kind of education and enjoyment. Beyond this, they are united by secret ritual, signs and passwords. The effect is to introduce a new tie between members of the same family (for membership frequently includes an entire household); to show neighbors how many things they can enjoy together; to speed up community efficiency; and to direct education and amusements toward real community needs.

The importance given by the Grange to woman's judgment and work has a very positive influence in extending her usefulness. It gives her an increased respect for her tasks at home and an active interest and influence in community betterment. Four offices in the Grange are necessarily filled by women, and others may be filled by them. That of lecturer in the Subordinate Granges is frequently held by a woman. Whether man or woman, the lecturer is charged as follows: "In selecting subjects, include the household and the home. A well-ordered household is essential to a happy home, and without a happy home, no farm is fully a success." With this idea in view, the National Grange has a home-economics committee; and the National Lecturer has prepared a handbook to aid the subordinate lecturers, in which is included home-economics work. Members of the Granges do well



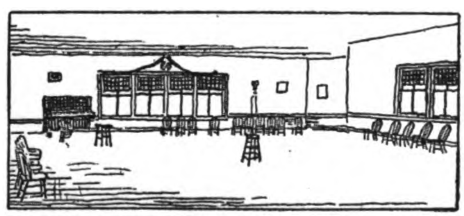


FIG. 280. Exterior (*above*); dining room (*center*); and assembly room (*below*) of a Grange hall in a small Wisconsin village. It contains also a kitchen, furnace room, men's smoking room, children's room and cloak room. It cost complete about $3,000 and is used for all sorts of social affairs as well as Grange meetings. (Wisconsin Bulletin 234.)

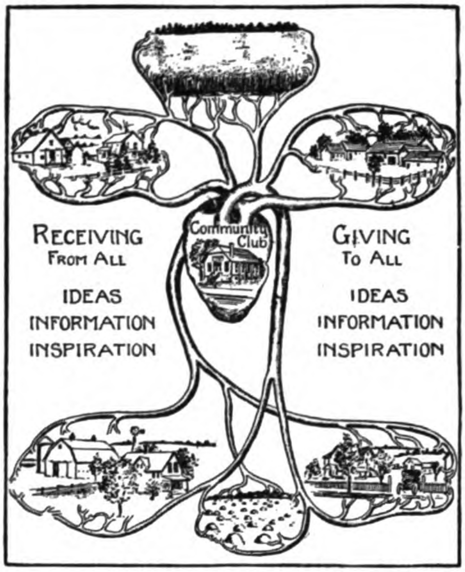


FIG. 281. The community club, rightly organized and conducted, can serve as the heart of the community through and by which a stream of inspiration and encouragement is sent to every member.

to qualify themselves for lecturing along household lines; they may also ask state colleges and other institutions to coöperate with them by supplying speakers. In line with this work, Subordinate Granges have greatly enhanced women's exhibits at state and county fairs by practical and helpful demonstrations of the home arts.

At each meeting of the Subordinate Granges, after the ritual is completed and the business transacted, there follows a program, which has been arranged by the lecturer. This may include music, recitations, readings, debates, and serious discussions of local conditions and needs. It may be followed by a "feast" or, as is frequently done, the session may be divided into two parts, the feast forming an excellent intermission, during which everyone is refreshed and stimulated by good food and by the exchange of ideas.

Meetings are often held in schoolhouses; and, when this is the case, an impetus is given to the valuable movement of making schools community-center meeting places. However, when Subordinate Granges are strong enough to erect their own halls, it is even better, for these are specially adapted to the social and educational life of the Grange.

How to establish a Grange. When it is desired to establish a Grange, the best plan to adopt is to write for a copy of the "National Grange Monthly," Westfield, Massachusetts, which will contain the name and address of the National Grand Master, who may be asked to send a copy of the last annual proceedings of the National Grange. This will give a list of the names and addresses of all the state masters. The master of the State Grange to which your Subordinate Grange will belong, will gladly coöperate with your neighborhood in every way, and will even send out organizers to start your work.

Pomona and State Granges. All the Subordinate Granges in one county often organize into a larger unit, called a "Pomona Grange." Pomona Granges have great monthly rallies, which comprise, as far as possible, the entire membership of the included Granges.

The State Granges are made up of delegates from the Subordinate Granges. They, as well as the National Grange, hold annual meetings only. Both of them are legislative and executive bodies and, considered by themselves, exert little social influence over the countryside. They are, however, the fountainheads of business, and clearing houses for subordinate activities.

Organization and history of the order. The Grange includes 7 degrees, the first 4 of which are conferred in the Subordinate Grange. The fifth degree is given in the Pomona Grange, the sixth in the State Grange, and the seventh in the National Grange.

The history of the Grange follows closely the development of farming as a science and a business since the Civil War. It has been the friend of almost every reform that has benefitted the farmer and his family since 1868. The study of its struggles and achievements might become with profit a part of the educational programs of Subordinate Granges.

The Farmers' Educational and Coöperative Union of America exists principally to regulate the business interests of farming. It is a secret order, exerting tremendous local influence, and possessing vast interests in fertilizer plants and in machinery and guano factories. By means of these Union-owned industries, localities are able to establish agencies for buying and selling in bulk, thereby driving to the wall small merchants as well as the retail agents of large interests. The Unions have sometimes been accused of impoverishing extended districts in this manner; but, in defense, they point to the increased efficiency on the farms, and to the larger incomes of farmers which have resulted. They maintain, moreover, that they have not used this boycott except when forced to it by unfair treatment. They are arrayed against the mortgage and credit system, and against graft, and they own a system of cotton warehouses in every cotton-growing state.

The order was organized in Texas in 1902, to exist for 50 years. It speedily absorbed a number of those organizations which had sprung up in rivalry of the Grange. By 1906, it had Unions in every southern state and in some northern ones. The total number in the United States was 6,870, and new charters were being issued at the rate of 25 a day. In

a few years, the membership reached 3,000,000; and it is still increasing, making steady headway in the North. Its membership includes both sexes, and receives Indians. Separate Unions have been established by negroes. Bankers, merchants, lawyers, and members of trusts and combines which might prove injurious to farming, are rigidly excluded from membership.

The order coöperates with organized labor, and pledges itself to give preference to the products of labor which is organized, and that its leaders shall coöperate with those of labor in efforts for legislative and political justice.

The American Society of Equity of North America. The local units of this National organization have great independence of action. Members are expected to extend fraternal care to one another in illness and misfortune. Harmony and brotherly debate are urged for the settlement of quarrels and disagreements. Meetings are held in the open country, in towns, and in hamlets. Its influence is mainly in the grain-growing belt. It was incorporated under the laws of Indiana in 1902, and is not a secret order. It exerts a strong influence in determining the prices of farmers' commodities.

National and State Organizations Without Local Units

The Dry-farming Congress. The Dry-farming Congress is an efficient association, holding yearly meetings with a large body of delegates. Its purpose is not only to make the "desert blossom as the rose," but to encourage everywhere an agricultural practice which shall conserve moisture to the utmost.

American International Congress of Farm Women. The American International Congress of Farm Women, organized at Colorado Springs in 1911 as an adjunct or fellow body to the Dry-farming Congress, held a number of interesting annual sessions, one of them in Belgium, and several in connection with the Dry-farming Congress in our arid states. In 1914, it separated from the Dry-farming Congress, in order to make clear its nation-wide scope, and met independently in 1915, but has been little heard of since that time. Its weakness lay in its lack of basic organization.

The Hartford Movement. The Hartford movement in Vermont owes its beginning to 100 influential men in Hartford township, who organized in 7 groups, to promote better farming, better schools, and wiser and more abundant recreation. Out of the movement, grew the Greater Vermont Association and the Bennington County Improvement Association, which receives help from the United States and from the Grain Growers' Association. Other Vermont counties have organized in a similar way. The movement has consolidated churches, and improved religious and social conditions in small towns. It carries on summer conferences in the open country, and, with the churches as centers, it encourages extension teaching and correspondence courses in modern agriculture and housekeeping.

The Amherst Movement. This movement for the enriching of social life in a farming country, was started by President Kenyon A. Butterfield, of the Massachusetts State Agricultural College, situated at Amherst. Its special contribution is a 5-week summer school, which closes each year with a conference of agricultural educators and rural social workers. Although it gives attention to technical agriculture, its emphasis is laid on the problems of church and school and such subjects as organization, reading, and amusements.

County Fair Associations

These associations provide in each county local agencies which operate through the different districts, encouraging organization among farmers and farm women in behalf of better production and better homes. They coöperate with the colleges in extension teaching; and the colleges, in turn, furnish the associations with exhibits, judges, and demonstrators for their shows. The results of their work are seen in the county fairs; but it is in the effort which local groups put forth in producing and preparing their exhibits that the real educational value of the movement lies. The people of the different neighborhoods may or may not hold regular meetings; but they are sure to visit together, in order to compare the results of their work, be it farming or household arts. Under community-spirited teachers, too, school-children are organized, in order to prepare their exhibits of sewing, cooking, and carpentry.

The feeling has become almost universal that these associations ought to become permanent, like the farmers' institutes, and not confine their activities to the short seasons when fairs are held. There is a tendency to employ as

fair-association secretary a man who is not a mere clerk, but an able agriculturist with the spirit of leadership, who will encourage an all-the-year-'round association, with every locality constantly alert in the study and practice of better farming and farm homes, and with neighbors brought together in frequent meetings for the exchange of ideas and the benefits of team work. Local fairs held in the schoolhouses or community halls are an excellent side activity of the associations.

AGRICULTURAL FAIRS

By Wm. L. Nelson *(see Chapter 9), who, as organizer, legislator, state official, representative of the press, practical farmer and student of men and things in the country, has had ample opportunity to arrive at definite and convincing conclusions about fairs. There has been a very noticeable change in these affairs, even within the present decade; for the most part, this change has been in the direction of improvement and greater usefulness. Mr. Nelson suggests how this change can be made still greater, and what is better, permanent.*—Editor.

THE agricultural fair, as we know it to-day, had its origin in the Old World fairs and market days. Bartering and buying led to comparison. As time went on, breeders met, compared, argued, and judged, as cattle were brought out for review. Gradually the sale features, while important, became secondary to the show. Competition created wider interest, and more people came to see and to learn. In the course of time, the idea spread to America. Here one of the first agricultural fairs was held in the District of Columbia, in 1804. In 1809, the Columbian Agricultural Society, whose membership included prominent residents of Maryland, Virginia, and the District of Columbia, held its first annual exhibition at Georgetown. One of the first country fairs in America was that of the Berkshire Agricultural Society, held at Pittsfield, Massachusetts, in 1810. A little more than a century later, the number of fairs—community, county, district, and state—in the United States was approximately 3,000, with a total attendance of several millions and with far-reaching influences.

Fairs as community builders. A fair has been defined as "a classified exposition of the products of the farm." As such, it is a great power for agricultural upbuilding and betterment. Fairs exert a wider influence, also. In fact, no organization working no greater number of days can do more for local social progress than can the fair that is clean, properly directed, and in full sympathy with its patrons. Such a fair more than mirrors the community; it educates and creates a desire for better things. Naturally, while building sentiment of the right kind, the fair is also serving as a business builder. Good livestock and choice field products, when exhibited at the fair, cause other farmers than the exhibitors to wish to breed better animals and to grow better crops. However, we are now thinking of fairs more especially as community builders.

Good and bad fairs. Fairs are variously classified; but, after all, they are either good or they are bad. The good fair is clean. It points the way to better living as well as to better livestock, and places morals and manhood above money. On the other hand, no matter how large the attendance or how complete the exhibits, the fair that openly encourages gambling, and licenses questionable and vulgar sideshows, is a failure. Boys and girls make up the best crop of the community. To make them secondary to any other, is a serious mistake. A clean fair represents more than good morals; it is good business. In every community there are more good people than bad, so that, in catering to the former, the fair management is working along lines that finally should prove profitable.

Making the good fair better. There are many things that can be done to make the good fair better. First of all, it should always be borne in mind that the fair is held for the people, and that, first of all, attention should be given to their health, comfort, and

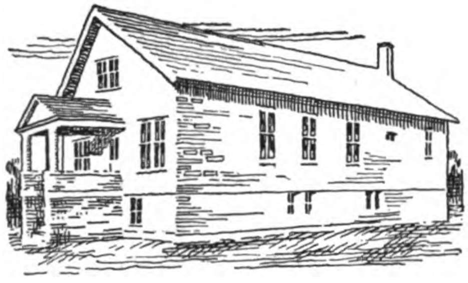


FIG. 282. A Wisconsin township hall built by a township tax for about $4,000, as the result of a movement started by the local Farmers' Club.

convenience. Accessible grounds, ample seating room, and decent toilet facilities must be provided. The picnic and social features are each year becoming more important. The automobile makes travel easy, and causes people to want to go somewhere. They will go to the fair, if proper inducements are held out. There must be ample parking places for cars; and it will be fortunate for the fair association if, in connection with the grounds, there is a well-shaded park. Pure drinking water, too, is necessary, if the crowds are to continue to come. With these things provided, visitors, meeting in a social way, can make a fair start toward entertaining themselves.

But there must be something to see. An up-to-date premium list, featuring the new things, holding fast to the old, and giving prominence to the activities and enterprises in which the lives of the people find fullest expression, will encourage large exhibits. Complete and proper classifications will also help. In livestock, these classifications are doubly important. Properly made, they encourage breeders to fit their best for the showring, and also make the exhibit of greater educational value to the onlookers. A competent judge, one in whose honesty and ability every exhibitor has confidence, should be engaged to pass upon the entries. Agricultural colleges supply such men, or some leading breeder may be selected.

Then, when the awards in any class have been made, the judge should be able to explain wherein one animal ranks above another. As the single-judge system comes more and more to replace the old-time committee of three, this feature grows in importance. Proper premiums attract entries, just as does a well-printed and carefully arranged premium list. Premiums should never be offered for freak exhibits, such as the largest egg or the tallest stalk of corn. It is better to feature the highest-scoring dozen of eggs or the best 10 ears of corn, quality and uniformity considered. The success of the community is not founded on freaks. These are not the things that pay for better schools, roads, and churches, that build comfortable homes, and make possible community entertainments. Special premiums for the best individual farm exhibit, the best school-district agricultural exhibit, the best township exhibit, or (in the case of a state fair) the best county exhibit, will help to fill the agricultural hall. One of the big problems of every fair association—and it is as yet unsolved—is how to make the money invested in fair grounds and equipment give direct returns to the community, county, or state, not only during fair week, but throughout the entire year. Larger uses to which fair grounds may be put are eagerly being sought.

Indirect influences of fairs. Fairs, whether good or bad, exert very strong indirect influences. The right kind of fair is both a character builder and a community builder. The week before such a fair is held, the community engages in a general clean-up. Company is coming, and the house—town or community—must be in order. Miles out in the country farmers join in the spirit. Fences are painted or whitewashed. and weeds along the roadsides are cut. More attention is given to the highways, which must be in good shape for the added travel that fair week brings. All these things have a good influence upon the people. One of the greatest of the many benefits that come from fairs is that of getting more people to take part in some community movement, to realize that they themselves are parts of a great coöperative concern. Every man who puts something into a fair, however little that something may be, gets something out of it. Interest in one community movement creates interest in others.

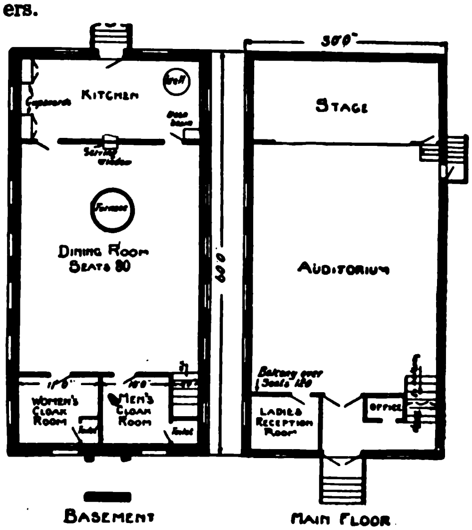


FIG. 283. Floor plans of the township hall shown in Fig. 281, which serves as a general gathering place for the whole community. (This and Fig. 281, Wis. Bulletin 271.)

COMMUNITY HEALTH AND SANITATION

By Mrs. Donald Budd Armstrong, *who was born in a country village in New York State, now lives on a Massachusetts farm, and is especially interested in the study of community health problems and how to solve them. Since rural community health and its betterment is a comparatively recent field, she, like most workers in it, has had to gain much of her experience in centers of denser population. But the principles of sanitation are everywhere alike; and the health of a family is of the same importance whether it lives in city or country. At present she is applying the knowledge gained elsewhere in coöperating with her husband who is directing the Community Health and Tuberculosis Demonstration at Framingham, Massachusetts. It is often said that the strength of a nation lies in its country folk; this is but one of many vital reasons why they should, first, be taught how to keep themselves, and their neighbors, and their surroundings healthy, and, second, assisted in doing so.*—Editor.

PEOPLE always think that the country is more healthful than the city. It ought to be, but it is not. More babies die in every thousand born in the country districts than in the crowded sections of New York City. Tuberculosis, too, is almost as prevalent in rural communities as in cities.

The country is not to blame for this, but country people are. They have not used the natural advantages of the country, while city people, of recent years, have been fighting against the disadvantages to health of city life, and so have outdone the country folk, who pay little attention to healthful living.

How to have Community Health

If each member of a family is healthy, then so is the family. The same is true of the community; for it is made up of families, just as a family is made up of individuals. Community health, then, is simply a larger family health.

In the city, each family has to depend on the city government to provide it with things which make health possible, such as pure air, pure food, pure water. The farm family is better off. No factories fill the air with smoke; no near-by houses shut off sunlight; each farm can control its own milk and water and much of its food supply. So there is no excuse for unwholesome living in rural communities. If each family keeps itself healthy, the whole community will be so.

What is necessary for health? We would say that, first, a person must *desire* health; second, he must *know how to get* health; and, third, he must *do and keep on doing* the things which will make him healthy and *avoid doing those things which will make him sick.* Family well-being depends on these same three things. All the members must work together to keep the house, the farm, and themselves in a sanitary and healthy condition; and so, too, must all the families work together to make the community well and strong.

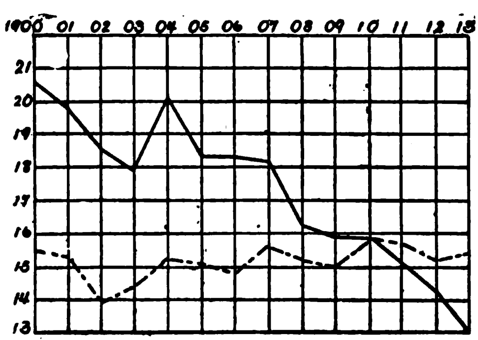


Fig. 284. City and country healthfulness compared. The solid line shows the death rate per 1,000 of population in New York City; the dotted line that in rural New York. Modern knowledge and scientific methods have steadily reduced the former. Conservatism and ignorance have left the country a more unhealthy place to live in than it has any reason or right to be. (N. Y. Dept. of Agriculture, Bulletin 62.)

To create health and prevent illness, four things are specially necessary. These are: (1) pure air; (2) pure, abundant, and wholesome food; (3) pure and abundant water; and (4) the observance of certain common-sense laws in respect to daily life.

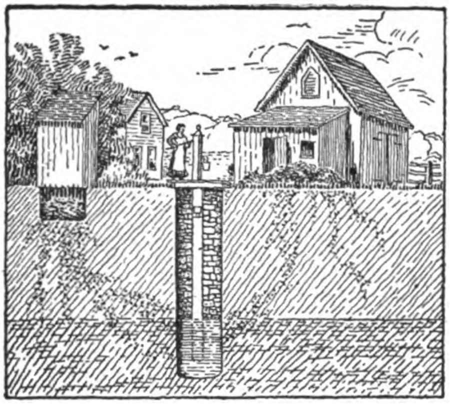


FIG. 285. Too many farm water supplies are polluted as shown here. This is one cause of the high rate of sickness and death in the country.

Pure air. Fresh air, winter and summer, night and day, for babies and everyone else, is needed to make good blood and sound lungs. It is necessary, too, because it is the best preventive of tuberculosis and consumption. Tuberculosis is not inherited; but a child whose relatives have it is more apt to get it, for 2 reasons: (1) he is built so that he is more susceptible to the germs; and (2) he is more exposed to the germs through living with someone who has it or in a house where someone has had it recently and which has not been properly cleaned and disinfected.

Every house should be cleaned and aired daily, in winter as well as in summer, even at the cost of extra fuel. Sunlight kills disease germs. Everyone, whatever his age, should always sleep with windows wide open. In case of sickness, especially colds, pneumonia, or tuberculosis, the sick person should have not less, but more, fresh air. Up-to-date doctors say that a serious case of pneumonia has a better chance of recovery out in a snowstorm than in a room with the windows closed. Delicate children should not be allowed to attend a school where windows are kept closed. Only old-fashioned doctors are afraid of drafts. If fresh air is good for sick people, it is surely good for well people. One reason for the great amount of consumption among women of the country is that they get no fresh air at all during the winter. There is no excuse for going without fresh air in the country. Anyone who has slept on a sleeping porch for a few weeks will never willingly sleep indoors again. Extra fuel and extra blankets cost less than medicine, doctors' bills, and caskets.

Pure, abundant, and wholesome food. Fresh air alone, however, will not keep a person healthy. Proper food is needed also. Country people have enough food, but often it is not proper food. There are more badly nourished school-children in the country than in the city. This is because city people eat a greater variety of food, and variety is necessary. The skin affection called pellagra is caused by a diet without variety.

The following are some of the principles of a proper diet: Vegetables and fruit are more important than meat. Fruit of some sort should be eaten daily, winter and summer. Lack of fruit may cause rickets and scurvy in children. Eggs and cheese may be used in place of meat. Cereals are a splendid food. At least 1 quart of milk a day should be allowed to each child in a family. Milk should be kept at a temperature of not over 50 degrees. Children contract tuberculosis through drinking milk from tuberculous cows, especially tuberculosis of the glands and joints, such as "white swelling," humpback, and hip disease. All milk for children, unless it comes from tuberculin-tested cows, should be heated, to kill the disease germs. This is called pasteurization. (See Chapter 13, "Teaching Children to be Healthy and Good.") Frying is the worst way of cooking food, and causes much of the indigestion so common in the country.

Pure and abundant water. Much less water per person is used in the country than in the city. Yet bathing is essential to health, and soap and water are the best disinfectants in the home. Money invested in a good, abundant water supply, is money invested in health.

The importance of drinking a great deal of water and of having it pure is very great. (See "How to Prevent Communicable Diseases," below, and Vol. III, Chap. 31, under "Water Supply.")

Common-sense laws in respect to daily life. What else besides air, food, and water is necessary to health? Plenty of sleep, proper clothing (especially suitable shoes), deep breathing, correct posture, regular meals, avoidance of alcohol and drugs and of the excessive use of tobacco, coffee, and tea.

FIG. 286. Insanitary, disease-breeding surroundings for a spring. (See Fig. 286.)

How to Prevent Communicable Diseases

We have just spoken of ways to insure health. What is necessary to prevent sickness? A great many illnesses are catching. The spread of such diseases could be entirely prevented, if proper precautions were taken; and,

in this way, 800,000 lives could be saved in the United States alone each year.

All contagious, infectious, and communicable diseases are caused by germs. Such germs are given off by the sick person in various ways, and are carried from person to person in several fashions. Some germs are given off in the urine and bowel movements.

FIG. 287. If a spring is to provide the family water supply, its purity must be assured and then protected by concrete curb and clean surroundings.

Typhoid fever. This is especially true of typhoid fever. Typhoid germs will live in water, in running water, even in ice; but boiling water kills them. Any well or stream which receives drainage from a privy or cesspool, or which is otherwise contaminated by human excreta, may carry typhoid to people drinking the water. Some persons who had typhoid years ago, and some who never have had typhoid, may carry germs in their intestines. These people are called "typhoid carriers."

The fact that no one has yet been made sick by water from a certain well, will not prevent some one from catching typhoid from that well to-morrow. Privies should never be built to overhang a stream or to drain into it. Water for drinking purposes should not be used from a well which receives any surface drainage, nor from a stream, unless the water is boiled. The State of Pennsylvania has protected her water supplies from contamination since 1906, and in that time has decreased the number of people in every hundred thousand who die yearly of typhoid, from 55 to fewer than 18, thus saving thousands of lives and hundreds of thousands of dollars.

FIG. 288. The neglected, tumble-down, fly-infested privy is a too common source of widespread disease.

Typhoid germs live in milk and food also. Milk, therefore, should not be put into utensils washed in dirty water. Milking should not be done by any person who has recently had typhoid. All milkers should wash their hands thoroughly before milking. Milk and food for others should not be handled by a person ill of typhoid or diarrhea, or by a person taking care of any one having these diseases. Whole families have caught typhoid because the mother did both the nursing and the cooking.

Flies as germ carriers. Flies spread disease, especially diarrhea, typhoid, and tuberculosis. Flies walk in filth, collect germs on their hairy legs, and then spread the germs over food, milk containers, and on the baby's face. The fly walks about in the privy, over the sick baby's soiled diaper, or in the consumptive's spittle, and then over the food and in the milk. Flies should not be allowed to breed. The most dangerous fly, the common housefly, breeds chiefly in horse manure. It takes from 10 to 14 days to develop. The manure pit should, therefore, be screened and made flyproof. It should be emptied frequently, and the contents spread and dried. Before removal, the manure should be sprinkled with borax daily. This kills the fly larvae, and does not injure the manure as fertilizer.

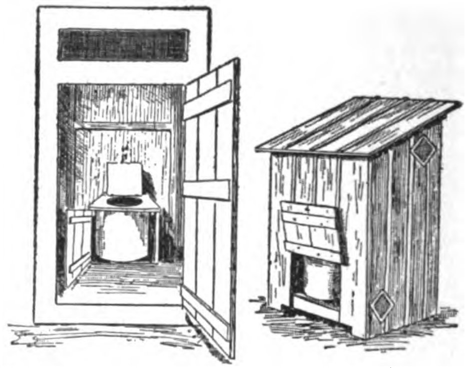


FIG. 289. Front and rear views of a privy within reach of any farm in simplicity and cheapness. It must be well built, however, tightly screened, and given frequent attention.

Every privy should be perfectly screened; all discharges of sick persons should be disinfected before being disposed of; and babies should be protected from flies with netting.

Twice as many babies were sick and died from diarrhea in a district in New York where screens and netting were not used as where they and their food were protected from flies.

Discharges from the nose and throat. The germs of other diseases are given off in discharges from the nose and throat. These diseases are tuberculosis of the lungs, pneumonia, bronchitis, tonsillitis, grippe, colds, and children's diseases, such as mumps, measles, chickenpox, whooping cough, scarlet fever, and diphtheria. It is not the scale from the rash that carries these diseases. The germ is in the "runny nose" and in the cough with which most of these diseases begin before they are recognized, and when they are most catching. These are serious diseases, and no child should be knowingly exposed to them. There were 6,000 deaths from whooping cough in the United States alone in 1916. These diseases have, too, very serious after-effects. Paralysis and heart trouble may follow diphtheria; deafness and kidney and heart troubles often come after scarlet fever; while a fatal pneumonia frequently succeeds measles.

Hygienic habits, which prevent the spread of these infections, should be practised, such as not kissing on the mouth, covering the mouth when coughing and sneezing, not spitting, and not sharing with any one towels, cups, spoons, pencils, candy, or gum. The quarantine (by which is meant confinement away from other people) of persons ill with these diseases, should be insisted upon by the whole community.

Sexual diseases. Other very serious contagious diseases which may be spread by the use of the same towel or cup are gonorrhea ("clap" and gleet) and syphilis, although these are usually sexually transmitted.

Malaria. Malaria is communicable. It is carried from a sick person to a healthy one by a mosquito. Malarial patients should be perfectly screened. Mosquitoes should be prevented from breeding. They take 11 days to develop, and breed only in stagnant water.

Fig. 290. This kind of back-yard is a favorite breeding place for flies, mosquitoes and the diseases they carry

Every one should take care not to allow water to stand in uncovered rain barrels, in cans, tubs, or elsewhere. The community should see to it that all swamps are either drained or covered with coal oil, for mosquitoes travel miles.

Hookworm disease. Hookworm disease, still common in the South, although much good work for its restriction has been done in recent years, is a serious malady. The worms are deposited in the soil in the bowel movements of persons affected with the disease, and thence enter the blood of healthy people who may happen to walk barefoot on the polluted soil.

Trichinosis, bubonic plague, trachoma and pink eye. Trichinosis is caused by a germ in pork that is not thoroughly cooked. Bubonic plague occurs mainly on the Pacific Coast, and is carried by the fleas on rats. Trachoma and pink eye are infectious eye diseases communicated by means of anything that has touched diseased eyelids.

How to Prevent Diseases that are not Contagious

Much could be done to prolong life, if other diseases that are not contagious, such as cancer and Bright's disease, were discovered early. A yearly medical examination of all persons would save many lives. All children should be examined at least once a year. Much backwardness in school is due to some curable, unsuspected physical defect. It is estimated that more than one quarter of all country children have enlarged tonsils, and nearly one-half have decayed teeth. Rheumatism and neuralgia are often caused by decayed or dirty

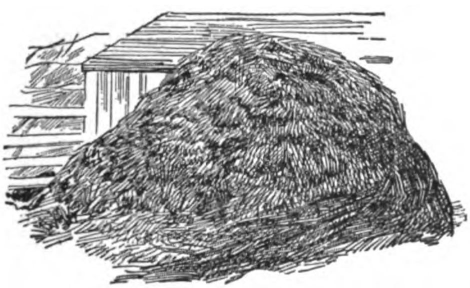


Fig. 291. The manure pile, unless rightly handled, is the breeding place of the house fly—now better known and feared as the "typhoid fly."

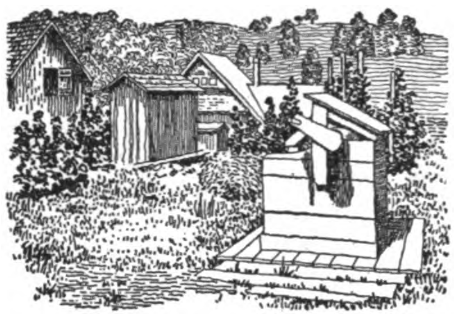


FIG. 292. Pollution of the water supply of these houses as the result of the location of the outhouses close to and above the well level, is almost certain.

teeth. A toothbrush should be used every morning and at night just before going to bed. A nourishing diet containing very few sweets is as necessary as the toothbrush to preserve the teeth. A healthy mouth, a healthy stomach, and general well-being depend upon the proper care and filling of the first, as well as the permanent set.

What to do in Illness

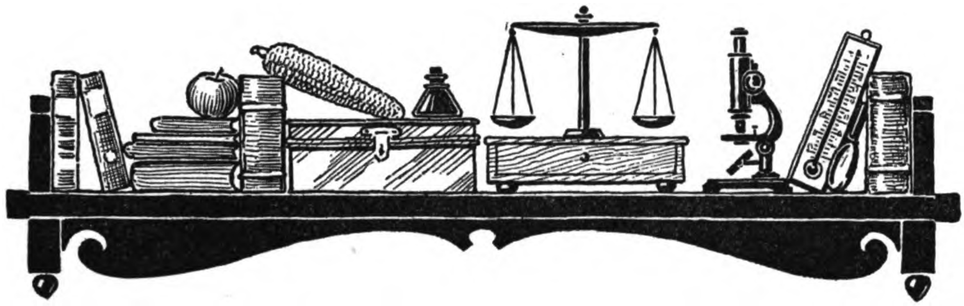
We have discussed rules of health, ways to prevent avoidable sickness, and methods of controlling other diseases. The next question is: When sickness occurs, what shall be done?

Immediate and excellent care should be provided. No one family can do this for itself. The whole community should work together to see that institutions are provided for such contagious and tuberculous cases as cannot be cared for properly at home, as well as institutions for the feeble-minded, epileptic, and insane. An association should be formed to provide domestic service in case of sickness, as well as maternity, visiting, and trained nurses, as has been done by the Dutchess County (New York) Public Health Association. Free school and dispensary treatment should be provided. It is a waste of money to spend school taxes to educate children who are not physically fit to be in school. Bad eyes, bad teeth, and diseased breathing passages should be corrected—free of charge, if necessary.

Health officers. A rural community needs, as much as any city, a full-time health officer. He should be responsible to the community for the registration of births and deaths, the reporting of diseases, the enforcement of quarantine, the provision of free vaccination against smallpox and typhoid, and of free nitrate of silver for use in the eyes of new-born babies, to prevent blindness. He should test cattle for tuberculosis, and milk-handlers for typhoid, and examine medically all school-children. He should see that only reputable doctors are allowed to practise in his district, and should enforce the laws against harmful patent medicines and traffic in drugs.

Educational campaigns. However, a health officer cannot accomplish much in an ignorant community. The only real way in which a community can be healthy is by educating everyone in it regarding health. Educational campaigns should be carried on by every possible agency — schools, churches, Granges, county fairs, newspapers, libraries, and fraternal organizations. The Town and County Nursing Service of the American Red Cross counts the educational work which it is doing in the homes and schools as of even greater importance than the relief it gives to the suffering. Insurance agents, visiting nurses, and cooking teachers can carry health education into homes. Such campaigns have saved thousands of lives throughout the country.

FIG. 293. The first taxpayers' county hospital in the world. Built in Washington County, Iowa, it provides a rural community with the same sort of advantages that city folk enjoy.



FARM KNOWLEDGE

VOLUME IV—PART III

Science and the Farmer

EVERY human activity falls into one of two great divisions; either it is a science or it is an art. Science may be called knowledge arranged in a systematic manner; an art consists of the practical application of such knowledge in accomplishing some desired result. From another viewpoint we may say, in the words of an authority who knows both sides, "A science is a collection of facts based on definite, natural laws; it can be learned and taught by means of books. An art is the personal interpretation and use of such facts; it cannot be learnt from books but must be acquired by practice." On this basis, farming clearly represents the combination of both science and art.

Farmers have not always in the past been prompt either to recognize or to welcome this fact. They have, indeed, tended to set up a barrier between themselves—whom they liked to think of as thoroughly "practical"—and the scientists—investigators and teachers—whom they viewed as theoretical, visionary and unbusinesslike. As a result there has existed for a long time an unfortunate gap across which the really invaluable information that the scientists have been collecting and arranging was unable to go in order to assist the art of successful farm practice. Doubtless there have been many contributing causes other than the farmer's attitude. The scientists have not, perhaps, always been ready to go even half way for fear of lessening the dignity of their calling; their reports and conclusions were not always put in the form or language best suited to the needs of the layman; the sum total of real scientific farming knowledge was, after all, very limited; and the equipment needed for fully utilizing it was incomplete and only partially perfected.

Fortunately a new era of wider knowledge, broader understanding, greater sympathy, and greater coöperation and efficiency has arrived and is steadily extending its limits. Scientists are directing their efforts along lines in which the farmer needs the most assistance, and translating their discoveries into terms that he can use. Farmers, on the other hand, are looking to scientists for facts, and gradually developing a new appreciation of the value of experimental data and of advice based on theoretical principles.

The present part of this volume has been prepared with the idea of advancing this cause, of bringing still closer together the man who studies science and the man who uses it. It is not too much to say that however their meth-

ods may differ, the principles upon which they are based are the same; and that however dissimilar their materials, the goal towards which they aim is identical—namely the greater development and success of agriculture.

The classifying of the different kinds of science is a difficult and, at best, an unsatisfactory task. A familiar and convenient grouping gives us six fundamental sciences which, with their respective subject matter, are as follows: *mathematics*—numbers and their use; *astronomy*—the heavenly bodies, their movements, etc.; *physics*—matter, its laws and its properties; *chemistry*—composition and other properties of matter; *biology*—life in all its phases; and *sociology*—human society. But obviously even these groups are of necessity related and dependent one upon the other. Obviously, too, agriculture has its roots not in one or two, but in all these sciences. This fact alone should be sufficient to indicate not only its complexity, but also its importance and value in the world's progress.

The plan and purpose of FARM KNOWLEDGE do not permit a detailed survey of every branch of each science—nor would the farmer desire such a complete scientific treatise in a practical manual. The aim has been, therefore, to lay down in the simplest possible form the basic principles of a few of the sciences upon which farming more especially depends, and to include a few illustrations of some of the applications of those principles to practical farm operations and conditions. If the result is but to awaken in the minds of a few more farmers the thought that they, too, deserve the name of scientists; to give them a new, more acute idea of the dignity and depth of their vocation; and to enable them to work along new lines of systematic, carefully thought-out endeavor, it will have amply justified the effort taken to bring it about.—EDITOR.

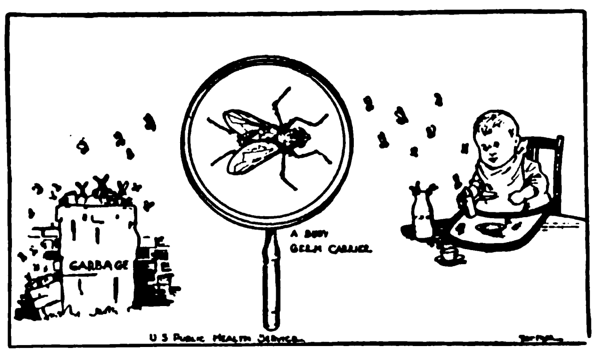


FIG. 294. Through science has come our knowledge of diseases, their causes, how they are transmitted, and how they can be controlled. Through practical application of this knowledge have come the methods by which we can keep ourselves and our communities healthy. This is but one illustration of the close relationship that exists in every phase and activity of farming, between science and art, knowledge and practice.

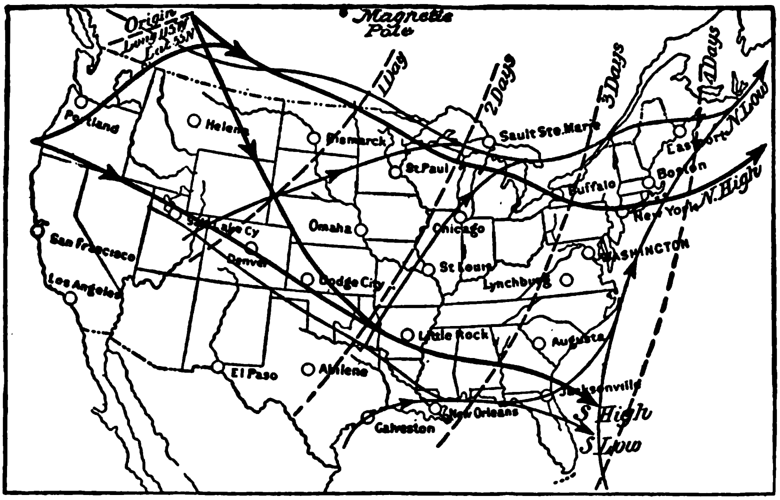


FIG. 295. Few people realize that storms tend to follow one general course. The heavy lines and arrows show the average tracks of high- and low-pressure areas over the United States. The broken lines show the average distance they travel each 24 hours. (See p. 355.)

CHAPTER 16

The Science of Physics

By PROFESSOR W. H. STEVENSON *of the Department of Agriculture of the Iowa State College, and Vice-Director of the State Agricultural Experiment Station, who introduces the subject and discusses it in its relation to soils and soil management;* PROFESSOR J. M. EVVARD *who treats of its relations with animal husbandry; and* PROFESSOR J. WARREN SMITH *who discusses those principles of physics that have to do with weather.*—EDITOR.

WHAT physics is. The aim of physics is to investigate and measure movements of or within materials, and to show how various forces operate upon or within these materials to produce certain effects; therefore, we may define physics as a science that deals with matter and energy.

Every farmer is interested in physics because he cannot conduct any operation on his farm that is not in some way based upon the principles of this science. The use of even the simplest tools, the plowing of the soil and the sowing and harvesting of the crops, bring into play many of the great underlying principles of physics. Thus, to understand almost any agricultural operation when considered from the standpoint of cause and effect, a knowledge of physics is fundamental. If it were not for our knowledge of physics, we would still be living in a primitive state, using the simplest forms of tools. During the last half century, the application of the principles of physics has given us our almost perfect farm implements. Moreover, physics has opened up a new field of investigation from the standpoint of the soil, and many of our most important soil problems have been solved because of knowledge gained through this science.

MATTER we generally think of as something that occupies space. However, this term can be understood more clearly if we consider a few of the general and special or individual properties of matter. A handsaw, for example, has length, breadth, and thickness. In addition to these general proper-

ties, it has special properties in that it is flexible, hard, and smooth. A portion of matter is called a *body*, while different kinds of matter, having definite properties, are called *substances*. A tin cup, a brick, and a shoe are bodies, while tin, clay, and leather, the materials from which these are made, are substances.

The following are a few of the properties exhibited by various forms of matter. They serve to indicate the complex nature of materials, and better enable the reader to appreciate the many factors which must be taken into consideration when dealing with any form of matter.

Some Properties of Matter

STATES—Matter exists in three states, namely, gaseous, liquid, and solid. Gases have a definite mass, but neither size nor shape. Liquids have a definite mass and size, but not shape. Solids have a definite mass and both size and shape. All three of these have an important bearing upon agriculture, but more especially will the physics of solids and liquids be considered.

MEASUREMENT—As already mentioned, matter occupies space, or it has dimensions. The *three dimensions* of a body are length, breadth, and thickness. In order to measure these, certain arbitrary standards have been chosen. In the United States, Canada, and Great Britain, the system most commonly used is the *English*. In France, Germany, and other countries on the continent of Europe, the *metric* system is used. The standard of length for the English system is called the *Imperial yard*. One third of a yard is the *foot*, and one thirty-sixth of a yard the *inch*.

In the metric system the standard is called the *meter*. One meter is equivalent to 39.37 inches. One tenth of a meter is called a *decimeter*, one tenth of a decimeter a *centimeter*, and one tenth of a centimeter a *millimeter*. Often the *kilometer* is referred to, which is 1000 meters. For measuring distances over land in many of the European countries, the kilometer is used as a standard.

POROSITY or the property of having pores or spaces between the particles is common to perhaps all forms of matter. The soil, for instance, may absorb a large amount of water and still not change in volume. This is due to the fact that a portion of the soil mass is made up of pore space which gives the soil a porous structure. Many field soils have a pore space that equals one half of their volume.

MALLEABILITY is the property of some substances of being hammered or rolled without breaking. Gold, silver, lead, tin, and some forms of iron are malleable. In many cases it is desirable to have castings used on farm machinery which are malleable.

HARDNESS is the resistance which a body offers to being scratched or cut by other bodies. In making a cold chisel, the cutting edge is tempered or hardened that the chisel may be used to cut iron.

The Mechanics of Solids

FORCE is some form of exertion which tends to produce or destroy the motion of mass.

MASS is sometimes defined as the quantity of matter in a body, or it is considered as the *weight* of a body. The earth's attraction for bodies is called *gravity*, and the force of gravity is spoken of as weight.

Measurement of Mass. The two standard units of mass are the *avoirdupois pound* for the English system and *kilogram* for the metric system. One sixteenth of a pound is called an *ounce*. The kilogram is equal to 1000 grams or about 2.2 pounds. One ounce is equivalent to 28.34 grams.

WORK is done when a force acts through distance or when motion is produced by the action of force. The unit of work is the *foot-pound*, which is the amount of work done in raising one pound through a distance of one foot. The rate of work is called *power*, and the unit of power most commonly used is the *horse-power*. A horse-power is work at the rate of 33,000 foot-pounds per minute. That is, if 33,000 pounds were raised through a distance of 1 foot in 1 minute, 1 horse-power of work would have been done.

MACHINE refers to a device for applying work. By means of machines various forces are changed and used to greater advantage. A machine must not be thought of as a source of work. In fact, the amount of work received from any machine is not as great as the amount put into it. There is always some force lost in overcoming friction. The ratio between the amount of work obtained from a machine and the amount put into it, is called the *efficiency* of that machine. Perhaps the most complicated piece of machinery in use on the farm consists of merely modifications of the simple machines. These simple machines are 6 in number: the *pulley*, *wheel and axle*, *inclined plane*, *wedge*, *screw*, and *lever*.

The pulley is a grooved wheel which is free to turn on an axle and over which a cord passes. A pulley affords no advantage except that of changing the direction of the power. In unloading hay with a hayfork, the horse must pull the entire weight of the fork and hay, and walk a distance equal to the height the load is raised. A combination of two or more pulleys is called a *block and*

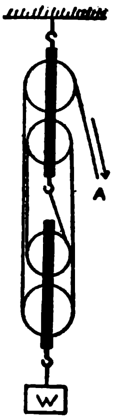


FIG. 296. Double pulley

tackle. In Fig. 296, in which 2 pulleys are contained in each block, the power is applied at A, to raise the weight W. This arrangement makes possible the lifting of heavy weights with only a small amount of power applied. The law or principle governing such a system of pulleys is: *The power applied is increased as many times as there are pulleys in both blocks.* For example:

What weight can be raised with a block and tackle which has 2 pulleys in each block, by applying 150 pounds pull to the free end of the rope? *Answer:* 150 × 4 = 600 lbs.

If the weight is known, and we wish to find how much of a pull will be needed, then: 600 ÷ 4 = 150 lbs.

The wheel and axle (Fig. 297) is only a modification of the lever and acts according to the same general laws or principles. The center of the axle represents the fulcrum, the radius (one-half the diameter) of the axle corresponds to the short arm, and the radius of the wheel to the long arm. *The power applied to the wheel is increased as many times as the radius of the wheel is times greater than the radius of the axle.* For example:

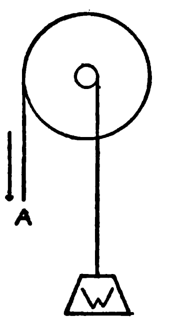


FIG. 297. Wheel and axle

A wheel 50 inches in diameter has a rope passing over it, upon which 100 pounds pull is exerted. What weight, attached to a rope winding around the axle which is 5 inches in diameter, can be raised?
5 : 50 : : 100 : ?
50 × 100 = 5000
5000 ÷ 5 = 1000 lbs. *Answer:*
Should we desire to find the power that it will take to raise 1500 pounds by the above wheel and axle, then:
5 : 50 : : ? : 1500
5 × 1500 = 7500
7500 ÷ 50 = 150 lbs. *Answer.*

One form of *wheel and axle* in use on the farm is the derrick. The rope on which the work is done is wrapped about the axle, while the wheel in most cases is connected to a second axle by spur gears. A crank is attached to the second axle and answers the same purpose as a wheel. This double arrangement makes the machine more efficient.

The inclined plane is an even, sloping surface at any angle between the horizontal and vertical. It may be used for rolling barrels onto a platform (Fig. 298). The law or principle governing the inclined plane is: *The power applied is increased as many times as the length of the incline is greater than the height.* For example:

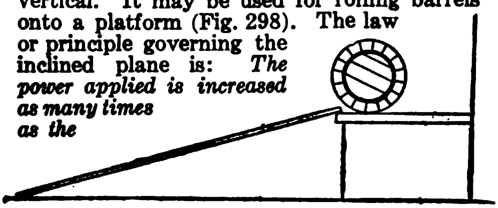


FIG. 298. The inclined plane

How heavy a barrel can a man roll onto a platform 3 feet high, by means of a 9-foot plank? This man finds that he can just lift 225 pounds from the ground onto the platform. *Answer:*
He can roll onto the platform then,
3 : 9 : : 225 : ?
9 × 225 = 2025
2025 ÷ 3 = 675 lbs. *Answer.*
Since the plank is 3 times longer than the height of the platform then he will be able to roll onto the platform 3 times as heavy a weight as he could lift.
If we know the length of the plank, the height of the platform and weight of the barrel, and wish to find the power necessary to roll the barrel up the plank, then
3 : 9 : : ? : 675
675 × 3 = 2025
2025 ÷ 9 = 225 lbs. *Answer.*
If we have the weight of the barrel, amount of power and height of the platform, and wish to know how long a plank to use, then
3 : ? : : 225 : 675
675 × 3 = 2025
2025 ÷ 225 = 9 feet
On the other hand, if we have the weight of the barrel, the pounds of power and the length of the plank, and want to find how high the weight may be raised, then
? : 9 : : 225 : 675
225 × 9 = 2025
2025 ÷ 675 = 3 feet. *Answer.*

A good illustration of the inclined plane is found in the tread mill, which consists of an endless apron passed over rollers at each end of the platform. Power is derived from a pulley which is placed upon the axle of one of the rollers.

The wedge is used in breaking open logs (Fig. 299) or large blocks of wood, and proves to be a most valuable though simple machine. The force acting upon the wedge is generally applied by heavy blows with a maul. The result is that the wedge, which is nothing more than a double inclined plane, breaks the log apart.

FIG. 299. The wedge

Because of the large amount of friction between the wedge and the material through which it is working, problems dealing with this simple machine are very difficult to compute. Neglecting friction, the following general principle governs the action of the wedge.

The power applied is increased as many times as the length of one side of the wedge is greater than ½ the thickness of its head.

If a wedge were 12 inches long and 4 inches across the head, then it would exert a force 6 times greater than the power applied; 12 inches divided by ½ the width of the head or 2 inches, equals 6. This, of course, only applies where friction is not considered.

The screw is a modification of the inclined plane, as may be seen by observing the threads which wind spirally around the cylinder. Familiar uses of the screw are found in the lifting jack (Fig. 300), the copying press and the bench vise.

The lever in its simplest form is a bar turning upon a point called a fulcrum (Fig. 303). The parts of the lever on each side of the fulcrum are the arms. The law or principle by which the lever acts is as follows: *The power*

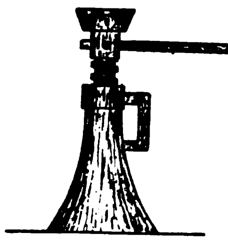


FIG. 300. The jackscrew

applied is increased as many times as the power arm exceeds the weight arm. In the form of a proportion this would be: *the length of the weight arm is to the length of the power arm as the power is to the weight.* For example:

What weight can a man, weighing 175 pounds, raise with a lever 12 feet long, the fulcrum being 2 feet from the weight, and 10 feet from the power?

2 : 10 :: 175 : ?
10 × 175 = 1750
1750 ÷ 2 = 875 lbs. *Answer.*

It will be seen that for every pound of power applied, 5 pounds of weight are raised. This is because the power arm is 5 times as long as the weight arm.

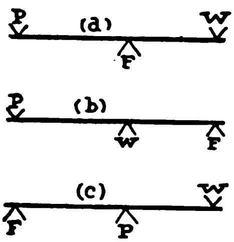


FIG. 301. The three classes of levers. P—power; F—fulcrum; W—weight.

There are three classes of levers as shown in Figures 301 and 302, many examples of which may be found about the farm. The pump handle represents a lever of the first class; the horse sweep is one of the second class; and the harness-maker's vise employs a lever of the third class.

From the foregoing it can be seen that before any satisfactory piece of machinery can be made, careful attention must be paid to the various properties of the materials which are to make it up. The weight of the materials, their porosity, hardness, malleability in many cases, and many other physical properties are studied. In addition to this, the different forms of machines are considered and attention is given to where they may be used to best advantage. Thus, if it were found that the lever would give the greatest efficiency at some place in a corn planter, it would be more desirable to use that type of simple machine than some other type. Often a single implement involves the use of several simple devices and thus a complicated machine results.

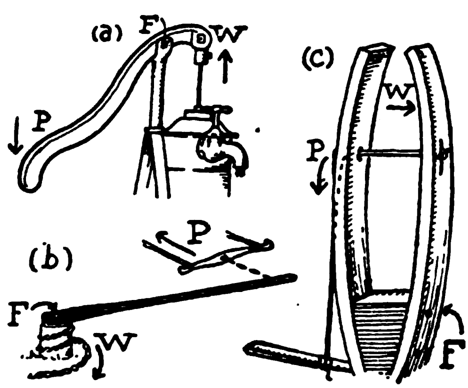


FIG. 302. Common farm machines illustrating the classes of levers shown in Fig. 301: *a* is a common pump handle; *b* is a horse sweep in which the drag of the chain around the post is the weight; *c* is a harness maker's vise in which the foot lever squeezes the jaws together in spite of the wedge which tends to hold them apart.

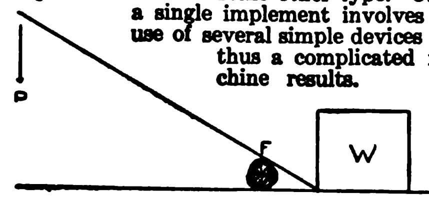


FIG. 303. The lever in its simplest form

The Mechanics of Fluids

SURFACE TENSION. The surface of a liquid differs greatly from the interior. It acts like a stretched membrane, and it is this surface action or *tension* that causes small quantities of water such as raindrops, to assume a spherical form.

CAPILLARY ACTION. Surface tension plays an important part in the rise of water in tubes of small bore. When one end of a very small glass tube is placed in water, the water passes up into the tube (Fig. 304). The smaller the tube, the farther will the water pass upward. In this case, the attraction of the glass for the water is greater than the water for itself. When a solid attracts a liquid in this way, the liquid wets it, and rises. This rising of water in the manner explained above is called *capillary action.* Oil rises in a wick, water in a sponge, ink in a blotter, and water in the soil by capillarity. Capillary water, or the water moving upward in the soil, is the only water used by plants. Therefore, the common field crops would not grow if capillary action did not take place.

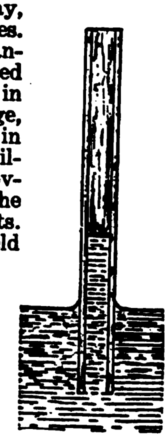


FIG. 304. Glass tube thrust into a liquid to show how the latter rises inside it by force of capillary action.

Heat and Cold

If one touches a stove in which there is a fire, the stove feels *hot;* if one touches a piece of ice, it feels *cold.* In the first case, the stove feels hot because it gives heat to the hand. In the second instance the ice feels

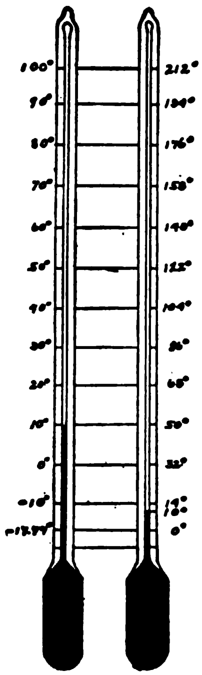


FIG. 305. Thermometers graduated according to the Centigrade (*left*) and Fahrenheit (*right*) scales. The mercury is at 10° above zero in each case.

cold because it *takes heat from the hand.* When hot water is poured into a cold pan, the pan becomes warmer and the water cooler. This is due to the fact that the heat has passed from the water into the pan. This continues until the two are at the same temperature.

TEMPERATURE is a measure of the degree of hotness of a body for which purpose the mercury-in-glass *thermometer* is usually employed. This type of thermometer is based upon the fact that mercury expands when heated, a portion of it passing from the bulb up into a tube of very small bore. When the mercury is cooled it contracts and returns to the bulb. The thermometer with the *Fahrenheit* scale is the one commonly used in English-speaking countries. The freezing point on this scale is 32 degrees above zero and the boiling point 212 degrees above. In scientific work, another scale called the *Centigrade* is used, in which the freezing point is zero, and the boiling point 100 degrees above zero. The thermometer readings are indicated by placing the letter of the scale name after the degrees. For example, 10° F. and 10° C. mean 10 degrees above zero on the Fahrenheit and Centigrade scales respectively (Fig. 305). In many places, where the temperature goes below—38.8 degrees C. or the freezing point of mercury, alcohol is used in place of mercury in the tube.

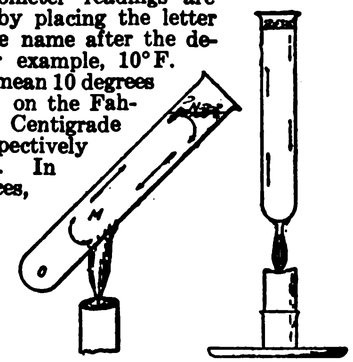


FIG. 306. Hot-water circulation. In the test tube at left, the water is cool at *O* and hot at M; some evaporates at N, the rest returning to be reheated. The same takes place in the other tube, the hot water rising along one side and the cooler descending on the other.

MEASUREMENT OF HEAT. The amount of heat gained or lost by a body when its temperature changes, is measured in terms of *calories.* The calorie, or unit of heat used in connection with the metric system, is the amount of heat necessary to raise the temperature of 1 gram of water 1 degree Centigrade. Heat is a form of energy, and the steam engine is nothing more than a device for transmitting heat energy, stored in the form of steam, into mechanical motion.

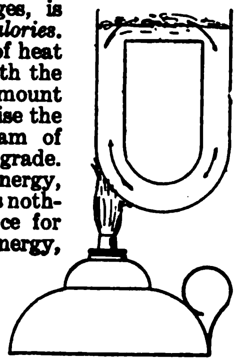


FIG. 307. Hot-water circulation by connection in a continuous tube. The greater weight of the cool water in the right arm increases the rate at which the warmed water rises in the left arm.

EXPANSION. In connection with the mercurial thermometer, it was mentioned that the mercury expanded when heated, and contracted when cooled. It is a familiar fact that solids *expand* when heated, and *contract* when cooled. The iron rails of the railroad are laid with a space between the ends to allow for expansion. In building sidewalks, joints should always be left at various places to allow for expansion of the concrete. In removing a glass stopper from a bottle, heat the neck of the bottle with a burning match and it will expand, thus releasing the stopper.

EVAPORATION. When water is heated to the boiling point, a change takes place and the water passes from the liquid to the gaseous state. This change involves what is known as *evaporation.*

DISTILLATION. In making absolutely pure water, the water is boiled, and the steam given off is passed through a pipe or tube surrounded by cold water. The steam, coming in contact with the walls of the cold tube, (A, Fig. 308), *condenses* or again assumes the liquid form. This process is called *distillation,* and by this means water free from vegetable and animal matter may be obtained.

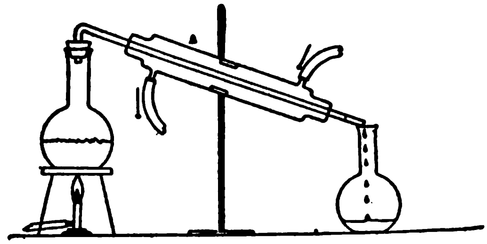


FIG. 308. Simple distillation apparatus. Steam from the flask is condensed when passed through the cold-water tube A.

THE PHYSICS OF THE SOIL

DAY after day, during many centuries, the rock masses which originally covered the entire surface of the earth have undergone many changes. Gradually this rock material has been acted upon by various agencies, and as a result, gravels, sands and soils have been formed.

Among the many agencies at work in breaking down the various rock materials, may be mentioned the wind, water, ice, temperature, plants, animals and bacteria. The process of breaking down rock and the gradual change to form soil, is called weathering. Soil is but small pieces of rock with which has been admixed organic matter, namely, small particles of decayed plant and animal life. Many of the agencies of rock decay or weathering are in action at the same time, and great changes are brought about upon the earth's surface during a period of only a few years. In this study we are chiefly concerned with the physical agencies of weathering.

Agencies of Rock Decay and Soil Formation

WIND in passing over the land picks up many fine particles of soil and sand. When driven against the surface of rocks, often with great force, these gradually wear away the rock. In this way rock masses are slowly broken down into soil.

The wind also transports soil particles from the place where they were originally found, to distant localities. Soil thus carried and deposited by the wind is called *loess* soil; great areas of it are found in the Mississippi Valley and in southwestern United States.

WATER is one of the most important agencies not only in wearing away rock, but also in transporting the weathered material to other places. *Erosion*, or the wearing away of the land by water, is a serious menace to agriculture in practically every part of the country. Often in a single field many acres are rendered useless by the destructive action of water. This problem of erosion does not have any direct bearing upon rock disintegration, but it shows how very destructive water may be. Water has still another effect upon the distribution of soil, in that it has the power of separating a soil mass into its various sized particles. In this way the finest particles, as silt and clay, are often laid down in very compact deposits known as *bottomland* soils.

FIG. 309. Erosion, one of the most effective agencies in both soil making and soil destroying, is an illustration of the working of physical laws.

The continued beating of rain, laden with dust particles, against the surface of rock, has a gradual wearing effect. This action may be observed over a period of years in localities where boulders are common.

PLANTS AND ANIMALS. Many of the simple plants such as lichens and mosses grow on the surfaces of rocks. Dust settles out of the air and collects about these plants, thus providing a foothold for other plants. Seeds of trees are blown into such accumulations of soil, and when conditions are favorable, the seeds germinate and trees are produced. The tree roots find their way into the rock crevices and, increasing in size, gradually break the rock apart. Plants play another rôle in soil formation in that they send their roots down through the soil; when these roots decay, the organic matter content of the soil is increased. This distribution of organic matter through the soil by the growth and death of plant roots is of great importance in making soils fertile.

Earthworms in passing through the soil open it up, thus providing better circulation of air and the freer movement of water. Gophers, moles, ground squirrels and other rodents have an effect similar to that of earthworms, except that their action is more pronounced.

TEMPERATURE. Rocks are made up of a collection of minerals which, when heated, do not all expand at the same rate. Due to these differences in expansion, many particles are broken from rock surfaces when they are heated. It is a familiar fact that large rocks may be broken by building a fire about them, getting them very hot, and then throwing cold water on them. A similar action, only on a smaller scale, takes place when rocks become heated by the sun's rays during the day, and then cool off at night. This is especially true during the winter.

ICE. In the centuries that have passed, large bodies of ice in the form of glaciers moved down across a portion of our country

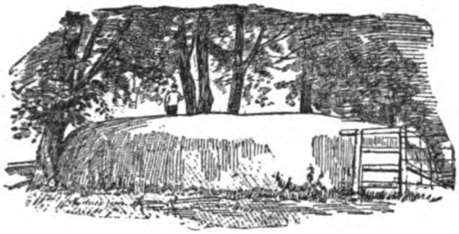


Fig. 310. Physics deals with forces—ranging all the way from those powerful enough to move this glacial boulder, to that with which a bacterium moves through the blood stream.

like a giant river. As these glaciers passed over the earth's surface, they ground up the rock beneath them. When the ice melted and the glaciers receded, all the rock which was ground up was distributed over the area covered by the body of ice. Soils formed by the movement of glaciers are called *drift* or *till* soils. They are fairly well supplied with the essential plant-food elements. The surface of the land now occupied by these drift soils varies from level to broken or abrupt.

BACTERIA. In addition to the above physical agencies, bacteria have an important part in the formation of soils. Bacteria are very small living plants. They are so small that it takes about 35,000 of them placed end to end to measure an inch. Bacteria multiply very rapidly and are present in most soils in exceedingly large numbers. They are important agents in soil formation in that they act, not only upon the rock particles, but also upon organic materials incorporated with the soil. When corn stalks, straw and stubble are plowed under, bacteria act upon them and gradually break them down into very simple compounds. In a short time we are no longer able to distinguish the different kinds of plants which have been turned under.

Size and Arrangement of Soil Particles

TEXTURE. Soil particles vary in size from gravel to those so small they cannot be seen with the naked eye. The texture of the soil refers to the size of the particles, the following table serving to indicate the differences in the texture of soils.

Very coarse sand	2.000 to 1.000 mm.*
Coarse sand	1.000 to 0.500 mm.
Medium sand	0.500 to 0.250 mm.
Fine sand	0.250 to 0.100 mm.
Very fine sand	0.100 to 0.050 mm.
Silt	0.050 to 0.005 mm.
Clay	0.005 to 0.000 mm.

* 1 millimeter, written mm., equals about 1/25 of an inch.

Thus the texture of a soil may be fine, medium, or coarse, depending upon the size of the particles composing it. *Sandy* soils are those in which sand predominates. *Clay* soils are those in which the largest percentage of the particles is clay. A *loam* soil is one which contains about one-half silt and clay, and the other half sand. The texture of the soil is of great importance because it is one of the main factors in determining the value of land from an agricultural standpoint. We can understand how, through the ages that have passed, a rock may be broken down into particles of various sizes. However, under normal conditions on the farm, texture can be little affected. A clay soil remains a clay, and a sand remains a sand. The only way we could vary the texture would be to mix two soils of different textures. This change is not practical in the field, of course, and is seldom made except on a very small scale as in a greenhouse bench or in a hotbed.

STRUCTURE. Structure refers to the arrangement or grouping of the soil particles. In many soils the texture is so fine and the particles fit so closely together that the soil is very compact. On the other hand, some soils have particles so large and loosely arranged that drainage is excessive and the soil undesirable from an agricultural standpoint. However, in normal soils, the particles vary in size, the small intermixing with the large. Loam may be considered as one of the most desirable of soils, since in it the particles are so arranged as to allow adequate drainage, and at the same time sufficient water is retained for plant uses.

Improvement of structure. The farmer can change the structure of the soil by the addition of organic matter, since the physical condition of the soil is dependent in a large measure upon this material. This change may be brought about by growing and turning under such crops as clover, alfalfa, sweet clover, and other green manure crops like rye and buckwheat. In addition to this, corn stalks, stubble, and straw serve to increase the organic matter content of soils and may, therefore, improve their structure.

Tillage. The various operations of tillage, which include plowing, subsoiling, harrowing, rolling, and cultivating serve to bring about a change in structure by rearranging the soil particles. The exact nature of the results produced by these operations, however, depends largely upon the moisture condition of the soil. If soil is plowed or cultivated when it is too wet, it soon bakes and

Fig. 311. Stones removed from a field of glacial till soil. They have an affect on the quality and condition of the soil and the ease with which it is handled.

forms clods. On the other hand, if soil is plowed when very dry, it turns over in large lumps and is not well pulverized.

Plants. As plant roots grow outward and downward and pass between the soil particles, the soil is opened up and a freer circulation of air takes place. One of the beneficial effects derived by growing a crop such as alfalfa, is that its root system extends far down into the soil, thus opening it up to a great depth. Rodents and earthworms also burrow through the soil and improve the structure by mixing the various soil constituents.

Lime. During the past few years many farmers have made applications of lime to their soils in order to neutralize the acid present. While this is one of the main reasons for applying lime to soils, there is still another equally important one, namely, the effect produced upon the structure of the soil. When lime, especially burned lime, is used, flocculation or the bringing together of the soil particles in the form of granules, is brought about. It is generally true that soils which contain lime are in better physical condition than soils of the same texture which do not contain this material in fair amounts.

Variation in water content may bring about a notable change in the structure of soils. If a soil contains a large amount of water it tends to become puddled. This is very undesirable from the standpoint of crop production. The proper installation of drains is the most satisfactory means of doing away with a surplus of soil water.

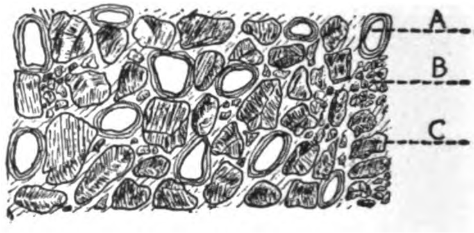


FIG. 313. Soil structure: *A* pore space; *B* granule composed of silt and clay particles; *C* sand or other larger soil particle.

Soil Water

Water in the soil has four main functions to perform. (1) Green plants have the power of manufacturing a large amount of plant food. In this process of food manufacture, water is used directly. (2) Water makes the plant food elements in the soil soluble and puts them in such form that they may be taken up by plants. (3) Plants require a large amount of moisture to keep them rigid, and this is all taken up from the soil through the plant roots. If more water passes from the plant by way of the leaves than is taken up by the roots, the plants wilt. Thus a sufficient supply of water in the soil is essential at all times. (4) Water is necessary for the multiplication and activities of bacteria.

KINDS OF SOIL WATER. Under normal conditions of rainfall, there are three kinds of water in the soil, namely, hygroscopic, capillary, and gravitational. The amount of each of these forms that is in the soil depends upon rainfall, texture, and structure of the soil, tillage, drainage, organic matter, and many other factors. The productive power of a soil depends very largely upon its water content and the ability of crops to take up moisture from the soil.

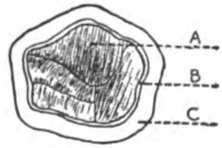


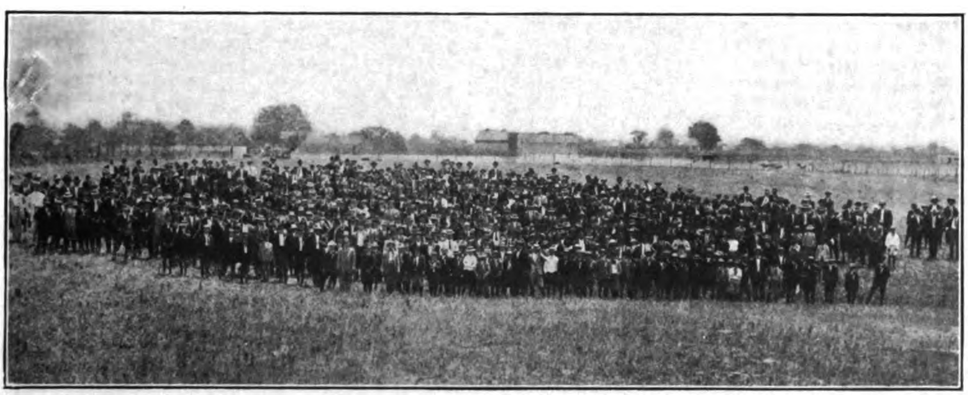
FIG. 312. Soil moisture: *A* soil particle; *B* hygroscopic water; *C* capillary water (greatly enlarged).

Hygroscopic water is the moisture in the soil surrounding the soil particles in the form of a very thin film. This type of water is lost only when the soil is oven dried. In other words, under field conditions, hygroscopic water is always present. However, this water is not available to plants because the roots are not able to take it up. It is a well-known fact that if we sow winter wheat in dry soil, and there are no rains following the seeding, the seed does not germinate. If, however, we take some of the dry surface soil from this field and heat it in an oven, it is found to contain water. This water which is given off is called hygroscopic water, and, as noted, it is of little importance in the growth of plants.

Capillary water (p. 340). We have often noticed that as fast as oil burns from a lamp, more oil is supplied by an upward movement through the wick. If we examine the wick carefully we find it is made up of porous material through which the oil is carried upward by capillary action. In the same way water rises, or moves sidewise, in the soil by passing through the small pore spaces between the soil particles. This type of water is called capillary water and is lost when the soil is air-dried.

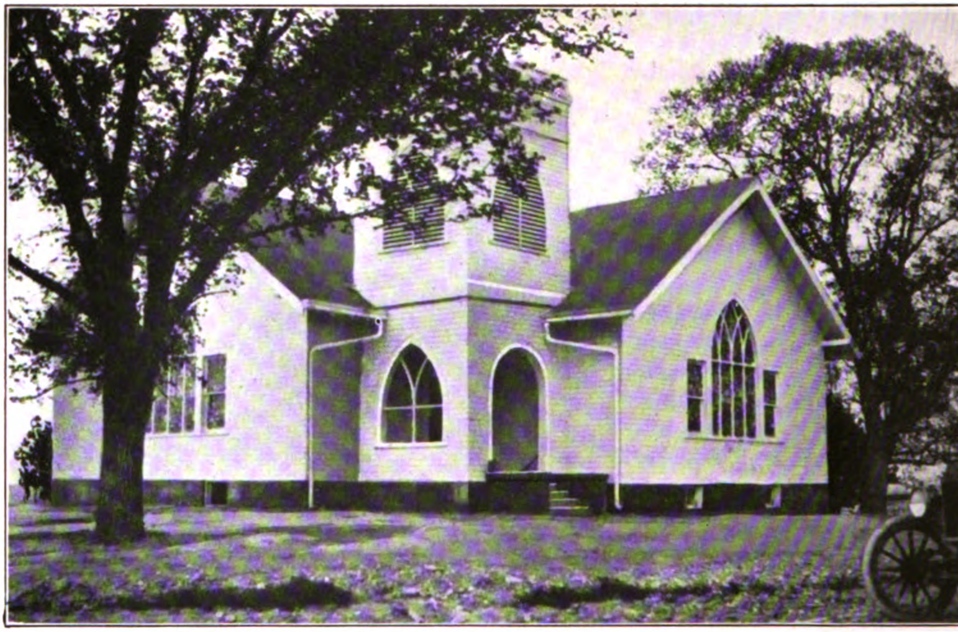
Gravitational water is that water which passes down through the soil by force of gravity. This kind of water passes off as drainage water, or runs off, and consequently is not available for plant use. If drainage conditions are not satisfactory and gravitational water is present, our ordinary field crops as corn, wheat, and oats, do not make a satisfactory growth. It is to the farmer's advantage then to keep the soil free from this type of water. There are some crops, however, as rice, which do make use of some gravitational water, thorough drainage of the fields being then undesirable. Hygroscopic and gravitational water cannot be used by our common field crops, capillary water being the only type that is available for the use of plants.

Jerry Moore, one of the pioneers in Corn Club work, and the 228 bushels and 3 pecks that he raised on an acre. Did he know a good thing when he saw the club movement coming his way?

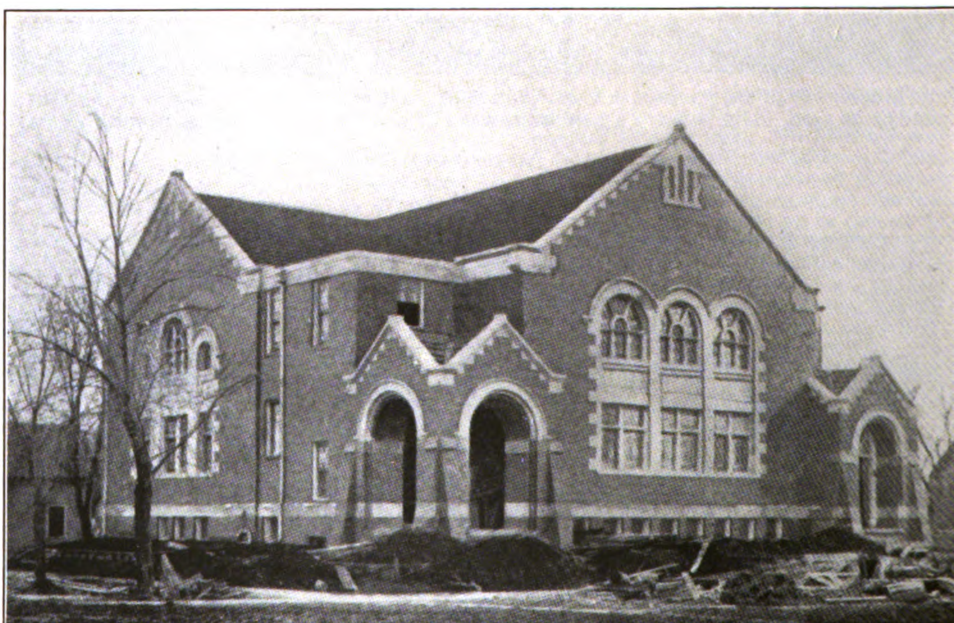


These boys, members of one Louisiana Corn Club visiting their State Experiment Station, would agree that he did; and in doing so they would express the feelings of a million or so

As One of the Many Results of Corn Club Extension Work, the Yield of Corn in Several Sections Has Been Increased 100 Per Cent or More. (U. S. Department of Agriculture)



A modern neighborhood church in Missouri



A building erected in an Iowa farming community to shelter under one roof, two or more religious denominations, a library and a gymnasium

THE COUNTRY CHURCH SHOULD BE THE CENTRE OF SOCIAL AND EDUCATIONAL, AS WELL AS RELIGIOUS, ACTIVITIES; IT SHOULD TAKE PART IN THE EVERY DAY LIFE OF ITS COMMUNITY

MAINTAINING AND INCREASING THE SOIL WATER. Irrigation is practised in many areas where there is not a sufficient amount of capillary water present in the soil to permit of the growth of plants. In the western part of the United States, thousands of acres of arid or semi-arid land have been made productive by irrigation water.

Mulches. In humid regions, or those receiving more than 20 inches of rainfall annually, the main problem in soil management as a rule is to conserve the moisture in the soil. This is accomplished chiefly by means of mulches. There are two general classes of mulches, the *foreign* and *natural.* The foreign mulch consists of such materials as straw, leaves, and manure scattered over the surface of the soil. The natural mulch, on the other hand, consists of the upper zone of the surface soil kept open and loose by thorough cultivation. Both types of mulches have the same function, namely, to prevent the loss of capillary water from the soil.

When a farmer cultivates his corn, he usually does so with the idea in mind that the principal object is to destroy the growth of weeds. However, in many cases one of the chief purposes in cultivating the soil is to conserve the capillary water.

If the soil upon which corn is growing is allowed to remain in a compact condition and is not cultivated from time to time, enough water may be lost to interfere seriously with the growth of the crop. But when the cultivator shovels pass through the soil, they break apart the soil granules and make the surface soil loose and dry. When the surface soil is in this condition, the upward movement of water through this zone is practically stopped and evaporation is reduced to a minimum. The mulch made by the cultivator usually varies in depth from 2 to 3 inches, depending upon the condition of the soil and the kind of cultivator used.

For corn, a type of tilling machine known as the "surface cultivator" is often used. The part of the implement which stirs the soil consists of flat blades which pass along just under the surface. This implement is designed to make an effective soil mulch without pruning the corn roots. The shovel type of cultivator often seriously injures corn because the shovels cut off the feeding roots of the young plants.

To be most effective, a mulch should be kept dry and loose. The only feasible way to maintain a mulch in this condition is to renew it after each rain. Moisture is thus conserved, and the soil warms up more quickly than when large amounts of water evaporate from the surface. Evaporation is always a cooling process.

Fallowing. In some states where the rainfall is exceedingly light, fallowing is practised to retain moisture in the soil. When this system is practised, a crop is usually grown only every other year. When a fallow system is followed, a portion of the farm is cropped and another portion is carried through the summer without a crop. The latter area is harrowed or cultivated after each rain, or oftener, to form and maintain a mulch. As a result of this practice, one crop gets the benefit of two years' rainfall.

FIG. 314. In a compact soil (*left*) moisture rises through cracks, wormholes, etc., by capillarity action and is lost by evaporation. Tillage or any sort of mulch (*right*) destroys the capillary tubes and thereby conserves the moisture.

In humid sections, the summer fallow is not in general use but is sometimes employed to increase the moisture content of the soil for some crop such as alfalfa that is to be seeded in the fall. In this case the alfalfa has the benefit of the stored rainfall that fell during the summer and fall, and as a result, a stand is more likely to be secured.

Organic matter. Organic matter which is thoroughly decomposed has great capacity for holding water. Such material is very porous and acts much like a sponge. In addition to having a direct effect upon the water-holding power of soils, organic matter tends to hold soil particles together in the form of granules or crumbs. When a soil possesses this granular structure, it is usually in an excellent physical condition.

Fall plowing. One of the beneficial effects of fall plowing is the conservation of water in the soil. The surface soil which is turned over acts as a mulch and prevents the loss of large amounts of water during the fall and winter months. In the spring, the land should be disked as early as possible without injury to the soil structure, to provide a mulch and retain any moisture which may have entered the soil due to winter rains or the melting of snow.

Decreasing soil water. Two general methods used for decreasing the amount of soil water are: (1) the installation of suitable drains, and (2) rolling the land.

Drainage. Perhaps the most effective means of decreasing soil water is by drainage. This consists of opening up channels in the soil through which surplus water may run off by the force of gravity. The tile drain is preferred above the open ditch because its use insures more thorough drainage of the soil, less waste of land, and more regular fields. The open ditch is undesirable since portions of the fields through which such a drain passes are worthless for the growing of farm crops, and, moreover, open ditches usually cut up the farm into irregular fields that are difficult to cultivate.

Rolling. In the spring when there is not a

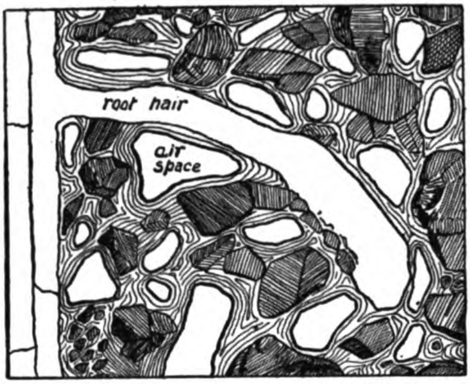


FIG. 315. Part of a root, showing root hair extending among the soil particles which are surrounded by water films. Note air spaces. (All greatly enlarged.)

sufficient amount of water in the soil, and when the seedbed is very dry and loose, rolling is sometimes practised. The surface soil is compacted by this operation and the capillary water moves more rapidly to the surface. Usually the harrow is used a few days following rolling, in order to establish a mulch and prevent too great a loss of water.

Soil Air

The amount of air present in a soil is determined largely by the water content of the soil mass. When the water increases in amount, a proportional decrease takes place in the air present. Air is as important for the growth of crops as it is for animals.

If a soil is poorly drained, and contains a large amount of water, crops suffer because of a lack of air and, often, seeds fail to germinate. It is also necessary for the life of many beneficial forms of bacteria that live in the soil. Some of these bacteria, it will be remembered, break down plant residues in the soil and change them into simple compounds which may be taken up by roots of growing crops. Other bacteria, which live in the small nodules on the roots of such crops as alfalfa and clover, have the power to secure nitrogen from the air and fix it in compounds that may be used by growing plants. This process is called *nitrogen fixation*. We find that if there is not an ample supply of air in the soil, these nitrogen-fixing organisms cannot carry on their very important work. The amount of air in a soil is determined by its texture, structure, and its content of organic matter and water.

Texture. Under ordinary field conditions, soil of fine texture such as a clay, contains the largest amount of air space. On the other hand, the air spaces in a sandy soil are larger, and as a result, air moves more freely in this type of soil than in clay. When air circulates through the soil rapidly, the soil moisture tends to decrease in amount. In a region of low rainfall and high temperatures, this loss of water should be guarded against at all times.

Structure. The structure of a soil changes from time to time depending chiefly upon the action of water and the presence of organic matter. The formation of soil granules tends to increase the amount of air which is present in a soil. Plowing, disking, harrowing, and cultivation all help to change the structure and increase the amount of air in the soil. By removing the gravitational water from a soil, conditions of aëration are improved. Since the amount of air in the soil increases with the amount of organic matter which the soil contains, applications of farm manure and green manure aid materially in soil ventilation. The volume of air in a soil is decreased by rolling or packing. These operations are common chiefly in the West where dry-land farming is practised.

The Heat of the Soil

Heat has an important relation to the germination of seeds. For instance, a favorable temperature for the germination of seeds of most common field crops is about 80 degrees Fahrenheit. Again, the multiplication and activities of the desirable kinds of soil bacteria are influenced by the temperature of the soil. The amount of heat in the soil determines to a certain extent the rate at which plant food goes into solution. The warmer the soil the more readily is plant food dissolved. A knowledge of the functions of heat

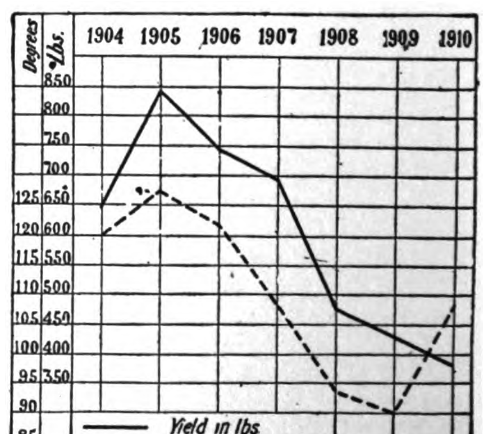


FIG. 316. Chart showing relation of the potato crop to the temperature of the soil at planting time, as indicated by a series of experiments in Russia. The solid line and second column of figures show the variations in yield; the broken line and first column give the total temperature of the soil for the ten days preceding the planting of the seed. (International Institute of Agriculture.)

and the means of temperature control is important since the farmer can, in a measure, control this important factor in crop production. The principal sources of heat in the soil are the direct rays of the sun, and decaying organic matter.

The sun's rays either directly or indirectly make it possible for soils to support plant life. Soils have the power of taking heat from the sun's rays, and the darker the soil the more readily is this heat absorbed. Dry soils warm up more quickly than wet soils, because in the case of dry soils little heat is used in warming and evaporating water. Heat may be carried into the soil by showers. In the spring, a warm rain falling upon the land may pass down into the lower layers of soil and thus warm up the soil to a great depth.

Under ordinary field conditions, it is difficult to determine just how effective decaying organic matter is in increasing the temperature of the soil. However, an ordinary hotbed is a good illustration of the heating power of decaying organic matter. Large amounts of manure are allowed to decay in a hotbed, and during the process of decomposition, enough heat is given off to aid materially in increasing the temperature of the seedbed. Undoubtedly the most important source of soil heat is the sun's rays. Field soils get very little heat from decaying organic matter.

The slope of the land may have a marked influence upon the temperature of the soil. The soil on a south slope is generally several degrees warmer than the same type of soil on the level or on a north slope. This difference in temperature makes a south slope desirable for truck crops, and gardeners have taken advantage of this fact in many parts of the country. The texture and structure of the soil probably do not have any direct effect upon the temperature, but the amount of heat in a soil is governed largely by its water content. Since texture and structure chiefly control the amount of water in a soil, these two factors may indirectly influence soil temperatures. A large amount of heat is required to evaporate water. For this reason a soil such as clay, which usually contains a large quantity of water, is generally cold. Sandy-loam soils usually warm up early in the spring because this type of soil is coarse in texture, and drainage conditions are quite satisfactory.

There are several farm practices which may be followed to regulate the temperature of the soil. For example, thorough drainage is the most effective means of getting rid of surplus soil water, and thus increasing the heat of the soil. Soil that has been properly drained can be seeded earlier in the spring because it is warmer than wet soil.

THE PHYSICS OF THE CARE OF LIVESTOCK

By PROFESSOR JOHN M. EVVARD *of the Iowa State College (see Volume III, Chapter 34), whose experience along animal husbandry lines at the Illinois, Missouri and Iowa Agricultural Colleges, following a boyhood of practical farm work and a general university course in agriculture, has given him a particularly keen knowledge of science as related to practice. It is sometimes difficult to work out the connection between abstract principles and concrete objects and operations. Professor Evvard has tied these two subjects together as he understands each of them.*—EDITOR.

THE laws of physics have deep significance in practical animal husbandry. To be able to turn them to economical account is of much value and importance to the livestock grower.

The Physics of Feeding

In the very make-up of the digestive apparatus of animals, there is a considerable variation so that we find the pig, for instance, adapted to highly concentrated feeds such as corn, barley, rye, wheat middlings, and milk, but very poorly adapted to the eating of rough feeds, such as timothy hay, corn fodder, or wheat straw. On the other hand, ruminants—animals with four stomachs, such as the ox or the sheep—are particularly well fitted for the handling of roughages.

Now how shall the feed be prepared for animals? Is the feed as nature made it good enough, or can we advantageously grind the corn, for instance, that goes into the stomachs of different animals?

It has been found that too much pampering and preparation through the physical reduction of the grains to a powdered or at least a finely divided form, is entirely unwarranted and physically wrong under certain conditions. A practical livestock man keeps these things in mind, and prepares his feeds according to the class and needs of the stock.

Generally speaking, rough fibrous feeds such as oats can be ground to advantage for dairy cows, or sheep, or horses, or pigs, particularly when they are being pushed heavily or crowded excessively.

The soaking of feeds, really a mechanical method of softening them, is in order, particularly if the feeds are rough and fibrous, and the soaking can be done economically.

Soaking, however, is more in order with pigs than with any other class of animals.

Cooking of feeds has not been found economical excepting perhaps the cooking of cull beans, potatoes and alfalfa for pigs, in which cases the cooking brings about physical changes. In the case of potatoes, it reduces the starch granules to a more soluble form; with beans it increases the palatability and breaks down the fibrous hull; and with alfalfa it increases the tenderness and palatability, and renders the fibre more vulnerable to the digestive juices. With show animals, cooking is often of advantage.

How to water livestock is quite an interesting problem. With dairy cattle it is good practice to keep water accessible at all times; and in winter it is a good proposition to use a tank heater and thus keep ice out of the troughs. Sheep do splendidly if the water is kept open and before them all the time. They even thrive nicely if water is in a semi-frozen condition, but it is preferable that it does not contain ice.

There has been a great deal of discussion as to the time to water horses,—before meals, during meals, or after meals, but about the best conclusion one can come to is simply to instruct the novice to water the horses whenever they will drink, in truth to keep water before them always, if possible. Of course, a real "hot" horse should not be watered excessively on cold water because it is liable to chill him and cause serious digestive disturbances because of the nervous shock.

As for hogs, in summer, open running water is in order, and if it is quite cool, all the better; in winter, it is a good plan to keep the ice out of the water.

How often to feed? Shall we feed once a day, or twice, or three times? With animals that have simple stomachs, particularly young animals, frequent feeding is in order. This is true of young lambs as well as young pigs. A little calf should be fed very often if best results are to be secured.

Fig. 317. The more comfortable and contented livestock are kept, the more readily do they respond to intelligent treatment. How to keep them so is largely a problem in applied physics.

Shall we feed animals all they will eat, or shall we limit the ration? This depends upon so many factors that it is difficult to decide, but generally speaking, if one wishes to finish his animals quickly and secure a high dressing percentage and that with a relatively less amount of dry matter, full-feeding usually wins as compared to limited feeding of grain. But on the other hand, if grain is very high priced, and roughage comparatively cheap, limited feeding, particularly when corn silage is used, has the preference.

Bulk in the ration is important, particularly with breeding stock and with ruminants. Young calves, for instance, do very poorly if kept on a milk diet; their "roughage" stomachs do not develop properly and oftentimes they become unthrifty. A certain amount of bulk in the ration also tends to keep down digestive disturbances, particularly when the animals are being heavily fed on concentrated feeds. A certain amount of bulk also tends to promote laxativeness which is a blessing as contrasted with constipation.

But for fattening animals it is sometimes inadvisable to get too much bulk in the ration, especially in the case of pigs which can not stand much fibre.

Feeds may be compared to gasoline or coal since they are eaten by animals to keep up their body heat as well as to be converted into storage products. Of all the heat units given in the form of feed to a draft horse, 25 per cent is used just to keep his weight up, 20 per cent is used for locomotion, 5 per cent is used for ascending grades, and 50 per cent is used for pulling or for draft. After all of these needs are met, any surplus of feed is converted into fat much as a surplus of power in the motor of a gasoline engine is converted into stored electricity which is later used to start the motor or to furnish lights. This comparison is somewhat similar to the use of feeds by a horse.

Energy value of feeds. We can, therefore, talk of the net energy value of feeds which, physically speaking, means those heat units which the animals are able to use. There is always a certain amount of waste. For instance, a "four-stomached" ruminant eating corn meal is able to utilize only 46 units out of the total 100 consumed, 25 units being excreted in the feces and urine, and 29 being lost as heat, this latter covering the work of conversion. But even at that the animal organism is much more efficient than the steam engine.

There is a difference in animals as to how they can handle the net energy units of feed, swine being much more efficient than ruminants in this respect, as shown by the table at the top of the opposite page.

The physical wellbeing of the offspring is of considerable importance, the strength, vigor, and coat of new-born pigs or lambs being strikingly affected by the way the

Net Energy Values of 100 Pounds of Feed

THE FEED	UTILIZED BY SWINE	UTILIZED BY RUMINANTS
Corn	119 Units	85 Units
Barley	106 "	90 "
Wheat	109 "	92 "
Wheat middlings	104 "	59 "
Bran	75 "	53 "
Potatoes	25 "	18 "
Skimmilk	15 "	14 "

mothers are fed during the winter time. A ration of corn and corn silage, for instance, with ewes will not produce as strong lambs as corn, linseed oil meal and silage. A ration of corn alone for brood sows produces weak, small, refined, "little-boned" pigs. Add meat meal, or milk, or alfalfa to this ration, and the pigs come strong and lusty, big-boned, and well-coated. Physically speaking, one has to supply the mothers with the kind of building material that the little pigs or the little lambs or the little colts or the little calves are made out of—else it is physically impossible for the youngsters within to grow and thrive.

The Physics of Care and Management

Exercise is of immense importance in up-to-date, progressive livestock husbandry, particularly in the case of young growing animals, breeding stock, and those types of horses whose prime function is to exercise in a peculiarly stylish way. The question is largely how much or how little exercise should be given. An old saying comes from the Arabs, the greatest of horsemen of olden times, that "Rest and fat are the greatest enemies of the horse." The horse is an animal of motion, therefore it is essential to keep him performing that particular function. If exercised liberally, he will not fatten unduly.

It is excellent to induce exercise under proper conditions. A bull can be kept in an open paddock, or hitched by means of the ring attached to his nose to a staff on the other end of which is a ring circling a long wire stretched between buildings or posts. A stallion can be kept in an open paddock, worked in the field, or driven on the road. Breeding sheep carrying lambs can be induced to take exercise by scattering the rough feed before them on the pasture so that they will be compelled to reach down and get it, and pick it up here and there. They can also be fed far afield. Brood sows can be hustled about by suitable inventions such as (1) the making of snow paths for them in the winter time leading from their sleeping quarters to the feeding place or out to the field and back; (2) the placing of their feed a half mile or so distant from their sleeping quarters; (3) the location of the watering troughs a few rods from their common abode. They can be allowed to follow cattle to earn their living through physical feed-hunting exercise, or they can be turned into the barnyard where they can work over the litter.

Shade and sunshine for livestock are to be doubly, yes, triply emphasized. In the hot summer months, natural or artificial shade is highly in order,—a place where the cattle, and sheep, and horses, and hogs, can go to avoid the hot, direct, penetrating rays of the sun. On the other hand, proper sunshine in season is highly commendable because it keeps the quarters clean, and brings joy and satisfaction into the lives of our domestic animals. Sunshine is a great death dealer to filth and disease-producing organisms.

Fresh air is to be commended, but it should be neither too cold nor too warm. Experience will teach us as to what is best, but in any case ventilation is fine and should be insisted upon. Close quarters are to be avoided, and livestock should not be overcrowded else they will not do well.

Handy feeding places that are efficient need attention. With a good feeding floor, one can always count on having a nice dry place upon which to feed his swine; this is important. Nice handy bunks which are neither too high nor too low, too wide nor too deep for the animals in question, are essential. The particular bunk should feed to best advantage the particular animal for which it is intended. The more comfortable the equipment makes the livestock, and the more easily you make the livestock do the things you wish them to do, the more easily and readily they will respond to your intelligent treatment.

The care of the coat is of interest and importance. Currying or grooming is of considerable value because it promotes thrift and vigor, straightens out the hair, removes the dust and dirt, and stimulates the surface skin and underlying tissues to healthy activity. Blanketing of horses and cattle is in order under certain conditions. Horses that are driven for miles on a cold day, should be blanketed at the end of the journey, especially if they are perspiring and hot, even though they are put in a barn. Steers that are being fitted for show, shed their coats more uniformly if the physical stimulation of a warm cover is continuously present.

Clipping the coat in the spring time is particularly advantageous in that it promotes a uniform shedding, and avoids the inconvenience of the driver becoming covered with shedded hairs. It also makes currying and cleaning easier, and if not done too soon in the spring, it is a great comfort to the animals.

Color considerations are frequently worth taking into account from a physical standpoint. White pigs, for instance, tend to blis-

ter more easily than black pigs. Hampshire swine which have white belts on black bodies tend to blister more easily where the skin and hair are white. For this reason, white hogs in the far South must be handled carefully especially during dewy, hot weather. Red is a protective color, as is black. It is noticeable that hogs tend to blister over the ears more than other places, because there is no hair on the ears to protect them. Their snouts will also be blistered at times for the same reason. When hogs are marked by the clipping system, care should be taken not to remove too much hair.

A concrete hog wallow for swine is exceptionally advantageous, particularly in the hot summer months. The hog has difficulty in keeping cool in the summer time, particularly when he is well fed, therefore, if he can get into the water, wetting himself thoroughly all over, evaporation will take the heat units from his body and thus keep him comfortably cool. It is well to arrange this wallow so that it will be easily accessible at all times, especially for fattening hogs.

It is often necessary to place mechanical constraint upon animals. The boar may have to have his tusks removed regularly by means of a bolt clipper or other scheme. This will prevent him doing serious physical damage if he happens to be of the wrong disposition. Yokes can be put upon cattle to prevent them from going through the fences. Rams can be blanketed so as to prevent them breeding the ewes out of season. Feeding racks can so be built that the weed and hay seed will not fall on to the necks of the sheep, and thus contaminate their wool with seeds and rubbish, hard to remove. The feet of horses, cattle, pigs and sheep should be trimmed in order to keep the hoofs healthy and upright so that the animal will walk nicely and not bend outwardly or inwardly in abnormal fashion. Such little mechanical maneuvers as these are of immense benefit.

Labor-saving devices are of immense importance in caring for animals, especially when the animals can act as the device themselves. In the "hogging-down" of corn, the animals, by doing physical work, are enabled to add much to the revenue from the farm.

The manurial waste from livestock is sometimes deplorable, and we should take advantage of all the physical and mechanical means possible to conserve the manurial value of our feeds. Practically all of our high-grade protein concentrates have a fertilizing value equal to at least half of their gross market value for feeding purposes. Meat meal tankage used for pig feeding has a fertilizer value approximately two-thirds of its feeding value. The man who feeds this material can recover as much as 90 per cent of the total fertilizing ingredients because the animal organism does not utilize more than 10 per cent, passing the balance into the manure. As our land grows older and as our soil becomes poorer, the fertility values of feeds must be remembered.

Warmth and Shelter.—The wool on the sheep is of particular advantage in keeping the animals warm. This animal stands out in marked contrast to the pig which must be sheltered in a warm place to do well; outside feeding is out of the question, particularly in cold climates such as the northern corn belt. The dairy cow also needs warmth and care, yet on nice, warm, sunshiny days she should be turned out for a little exercise. The fattening beef steer is quite comparable to the fattening lamb in that he does better in the open shed. It is folly to attempt to feed steers under Corn Belt conditions as they do in southeastern sections. To tie the individuals in warm stalls is a waste of labor, of feed, and of the final product, not only as regards quantity but also as regards quality. There is such a thing as being too kind to domestic animals.

Ventilation. There should be an abundance of air in our stables and barns, yet not too much; drafts should by all means be avoided. In winter, ventilation is of course, more difficult to secure than in summer, but it should be kept in mind and striven for nevertheless.

Bedding the animals well is quite essential in that it makes them warmer and more comfortable, protects them from the dampness, and serves to absorb the manurial residue which is otherwise drained away or makes a wet, soggy place in the barn. Excellent bedding is provided in shredded corn stover, the pith of which absorbs a large amount of moisture. Wheat straw is also good, and lasts much longer than oat straw because it is tougher and more fibrous. The point, though, is to get a good bed that is warm and dry.

One thing that is to be emphasized in the management of all classes of livestock, is protection from rain, snow and sleet. The dairy cow particularly should be well protected, and sheep should be kept out of cold driving rains which soak up their fleeces and increase their weight. All young stock should be very well protected, particularly growing pigs, and more especially very young ones. New-born lambs also need to come in warm quarters. The little colt and the little calf require and deserve special care at this time; in truth, it is the most critical time, in so far as housing is concerned, of any time in the life of the animal.

The question of where to feed animals often comes uppermost. Beef cattle can be fed (particularly their grain) on the southern slopes outside their sheds. It is well, however, to feed the roughage inside if possible. If the animals are in thin condition, inside feeding is more in order than if they are in the fattening stage. Dairy cattle should by all means be fed both grain and hay inside, particularly in the winter. In the summer time, they could be fed out on pasture if that is economically done, but preferably then in the shade. Horses in the summer time can

be fed either in the barn or out in the open, but it is common custom to feed growing colts and breeding stock out in the pasture under the shade of a tree. Sheep in the summer can be fed in the open but in the winter time it is perhaps a good plan to feed them under shelter. Where there is little rainfall, the precipitation coming mostly in the form of snow, outside feeding gives exceptionally good results. With swine the story is entirely different; even in the summer time, they should be fed in the shade if possible, and in the winter time under cover where it is warm and cozy. Pigs are like human beings and can not stand the excessive cold. From the standpoint of housing, therefore, the general management of livestock resolves itself down into a series of individual problems, particular attention being paid to the kind of animals and the purpose for which they are kept.

THE SCIENCE OF THE WEATHER

By PROFESSOR J. WARREN SMITH, *Chief of the Division of Agricultural Meteorology of the U. S. Weather Bureau. Raised on a New Hampshire farm, he graduated from the Agricultural College of that state in 1888, and took special work at Harvard College for 2 years, attending also the first graduate summer school at the Ohio State University. From 1890 to 1915 he was Section Director of the U. S. Weather Bureau in charge of climate and crop work being located in New England until 1896, in Montana from 1897 to 1898, and in Ohio from 1899 to 1915, except in 1910 when he was District Editor in Missouri. From 1898 to 1909 he was Special Lecturer in the College of Agriculture of the Ohio State University, becoming Professor of Meteorology there in 1911. In his present position, he has supervision of all special activities of the Weather Bureau in connection with agriculture, and edits the National Weather and Crop Bulletin. He is the author of a number of very practical bulletins on weather and crops.*—EDITOR.

LITTLE wonder that some races have been sun worshipers, because sunshine meant comfort and life to them, and its absence, suffering and even death. We now know that all life and action on the earth is sustained by the sun, and without the solar radiations, our globe would be a dark, cold mass, frozen solid. And yet the earth intercepts only one two-billionth part of the total energy given off by the sun, and we are so far away from it that if we had an arm long enough to reach the sun it would be 147 years before we would realize that the finger that touched it was being burned.

Warming and cooling. Heat is transferred by radiation, conduction, and convection. If a man stands near a large fire out of doors, the side of his body that is toward the fire will be warmed by it, even though the temperature of the air all around may be far below freezing. This transfer of heat from one object to another through a medium that may itself be little affected, is called *radiation*. Radiation from the sun warms the surface of the earth, but only very slightly warms the clean dry air through which it passes. *Conduction* is the transfer of heat by contact. If our hand is placed on a heated object, it is warmed by conduction to the hand; if upon a cold piece of metal, the hand is cooled by conduction of its heat to the metal. The surface of the earth and objects upon it are warmed by radiation from the sun, and the surrounding air is warmed by conduction. At night time, the surface of the ground becomes cooled by radiation of its heat through the air into space, and the air in contact with the ground is cooled by conduction.

The movement of heated air is called *convection*, and it is due to the fact that warmed air expands and becomes lighter and is pushed upward by the colder and denser air that surrounds it. If bits of light paper are let loose above a hot stove, they will be carried upward toward the ceiling; leaves are often seen rising to a considerable height above a brush fire. Air, therefore, that is warmed by conduction, is carried upward by convection and in turn warms other air by conduction and intermixture.

As the earth that is in direct sunshine is warmed faster than that in the shade, and the slopes which are perpendicular to the sun's rays faster than those which the rays strike more obliquely, and some objects gain heat faster in sunshine and lose it faster in the shadow than others, and as the air in contact with the earth rapidly acquires the temperature of these objects by conduction, and as adjacent masses of air of different temperature and density must flow to new positions of equilibrium under gravity, it follows that there is a constant shifting of the atmosphere about us due to the frequent variation in its density.

WHAT MAKES THE WIND BLOW. Variations in the density or pressure of the atmosphere, due to differences in temperature, cause movements in the atmosphere which

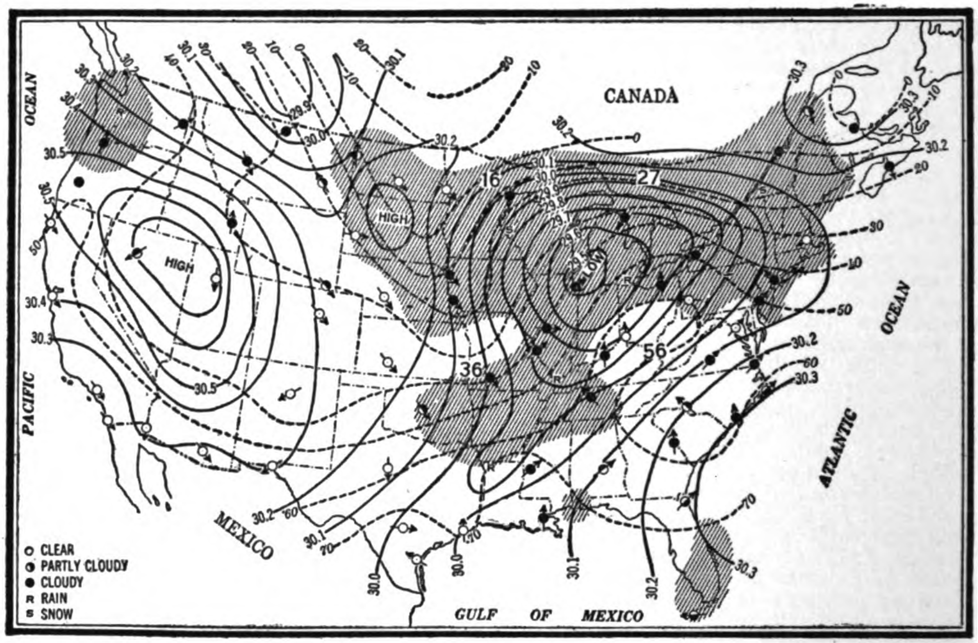


FIG. 318. These charts, adopted from U. S. Weather Bureau maps, show the progress in 12 hours of a typical winter storm, and the changes accompanying it. Black lines connect places having equal barometric pressure, dotted lines, those having equal temperature; circles show weather conditions, and arrows the wind direction. HIGH marks the center of a high-pressure (anti-cyclone) area, and LOW, the center of a low-pressure (cyclone) area. The shading shows the precipitation area; and the large figures show the average temperatures in the four quarters of the cyclone.

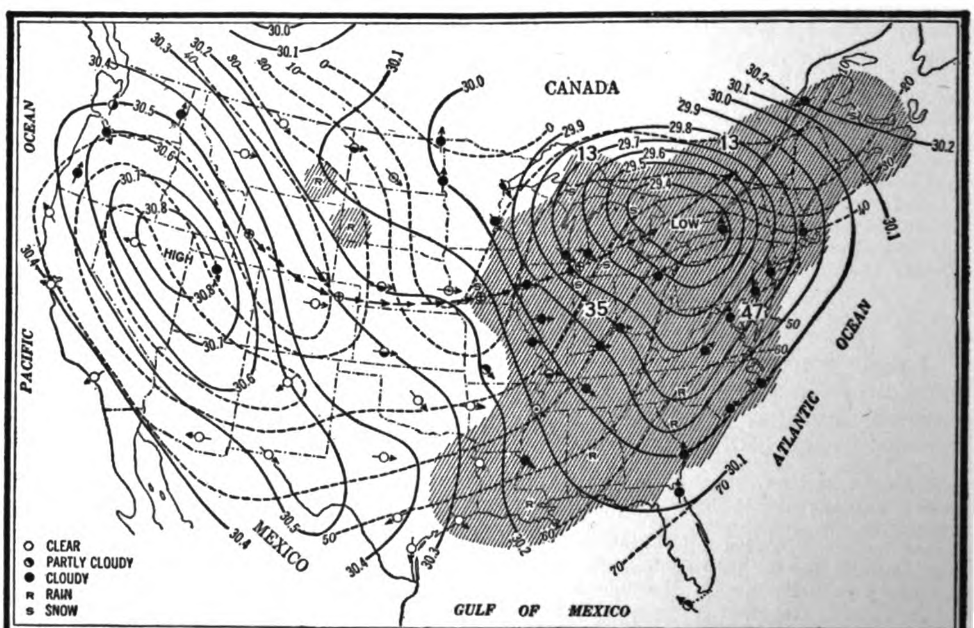


FIG. 319. Note that the storm center has moved from near Chicago to Buffalo; and that under the influence of the north winds following it, the temperature dropped suddenly and as much as 20 degrees in some places. The line of heavy black arrows shows the course of the storm center. Compare with Fig. 295.

are called winds. Although local variations in temperature cause an almost constant movement of the air around us, the more extended air movements or winds (both those which prevail at the surface of the earth and which carry along the clouds in the higher atmosphere) have more than a local origin. They are in fact related in a complex and indirect way to the great contrasts of temperature ranging all the way from the equator to the poles. Not only this, but the high south wind of yesterday, the strong northwest wind of today, and the cold raw wind of last week, were none of them due to local differences in temperature but were the cause themselves of the temperatures which we experienced.

The action of the sun's rays in causing higher temperatures in the equatorial regions than about the poles, higher temperatures over land in daytime and summertime than over water, higher over deserts than wooded regions, etc., cause permanent, seasonal, or accidental variations in atmospheric pressure in different parts of the earth, and in equalizing these differences in pressure, there are correspondingly permanent, seasonal, or accidental movements of large masses of air, which we designate as "winds."

Cyclones and anti-cyclones. The solar energy, acting in some manner not clearly understood, sets up atmospheric waves or whirls which are thus called. *Cyclones* are large areas of low barometric pressure influencing an area of from 500 to 3,000 miles in diameter, which (in the latitude of most of the United States) move eastward at an average velocity of about 600 miles in 24 hours. These must be distinguished from *tornadoes*, which are narrow violent storms causing great damage along comparatively short paths. *Anticyclones* are large areas of high pressure which move eastward with slightly less velocity than cyclones.

Daily weather maps. The cyclonic areas are shown by the words "low" and the anticyclones by the words "high" on the daily weather maps published by the United States Weather Bureau in different parts of the country, and are illustrated by Figures 318 and 319. Data showing pressure, temperature, weather, clouds, wind, etc., are telegraphed twice daily from hundreds of places in the United States and in other parts of the northern hemisphere to all the large cities of the country. These data are immediately charted on outline maps so that each 12 hours a weather picture is made covering thousands of miles in extent.

Laws of storms. The charting of the daily weather conditions in the manner referred to above has determined that there are certain well-defined laws in connection with the movements of the atmosphere:

1. *High and low pressure areas* move across the country in the latitude of most of the United States in an easterly direction. Figure 295 shows the average path and rate of movement.
2. *Surface winds* are controlled by differences in pressure. The wind blows toward areas of low pressure and away from areas of high pressure. See Figures 318 and 319.
3. The *temperature* at any place is influenced by the wind direction, and depends upon the temperature in the region from which the winds come. The maps show that it is warm to the east of the low pressure areas in the north temperate zone because the winds blow from the south, and colder to the west of them because the winds blow from the north.
4. Low pressure areas are usually accompanied by *cloudy weather* with rain or snow, while high pressure areas are more apt to be attended by clear skies and fair weather.
5. The lower the pressure at the center of the low, and the greater the variation between this pressure and that which surrounds it, the higher the wind velocity and the more likelihood of severe local storms such as *thunderstorms*, *hailstorms*, and *tornadoes* if it is in the summer time, since these are all local disturbances which occur in connection with the larger cyclonic whirls.

Weather Forecasts

Local weather signs. An observing person whose work takes him out of doors a good deal can make fairly accurate weather predictions from local weather signs for a few hours in advance. The most important matters to consider in this connection relate to the wind and the clouds.

WIND. As noted from the laws mentioned above, surface winds blow toward areas of low pressure. In the latitude of the United States, areas of low pressure move from the west toward the east and are usually accompanied by cloudy and stormy weather. Hence as the disturbance moves toward us from the west, the wind where we are sets in from the east, and is soon followed by rain or snow because the conditions which produce the rain and snow are moving toward us from the west. This is why east winds are proverbially rain winds, although the rain comes from the west and not from the east. After the storm center passes by, west winds prevail and the rain is followed by a spell of fair weather. This agrees with our experience that winds from the west are associated with clearing and fair weather. South winds are mild because they come from a warmer dis-

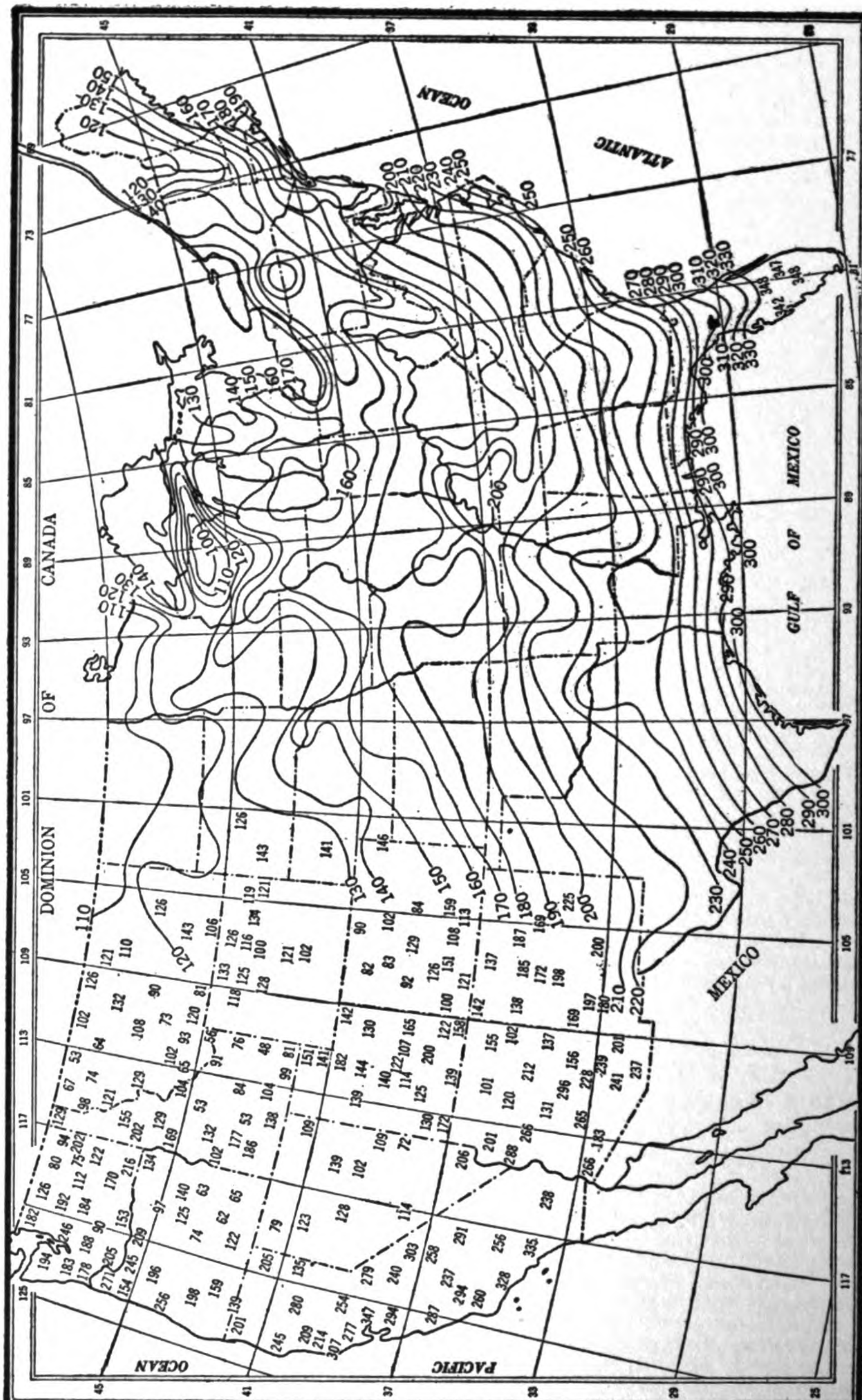


FIG. 320. Average length of the crop-growing season (in days) in different parts of the United States. The lines pass through places having seasons of equal length. West of the 101st meridian, variations in altitude, etc., cause great local variations which make any systematic charting impossible. (U. S. Weather Bureau.)

trict, and north winds are cold because from a region of lower temperature.

CLOUDS. The well-known couplet giving advice to sailors is worth recalling:

If clouds look like they had been scratched by a hen,
Get ready to reef your top-sails then.

The high, thin clouds which sometimes cause circles around the sun and moon (halos) are composed of ice particles which have been condensed in winds carried to a high altitude in a storm area that is approaching from the west. As these clouds become thicker and lower, the storm is getting nearer and nearer. If the high clouds are moving rapidly eastward and the sky below is partly covered with denser clouds moving westerly, then the storm is approaching rapidly, and heavy rain and strong winds may be expected. When the lower clouds begin to break up and enough clear sky can be seen "to patch a Dutchman's breeches," fair weather may be expected very soon. A brilliant sunset indicates that there is a large amount of moisture in the atmosphere that will probably be precipitated as dew during the night with fair weather the following day. A brilliant sunrise, on the other hand, indicates that the moisture which causes the bright colors will probably be condensed and precipitated as rain during the day. Hence:

Evening red and morning gray,
Will set the traveler on his way;
But evening gray and morning red
Will bring down rain upon his head.

HUMIDITY. There is usually an increase in the humidity of the atmosphere before a rain, because our rains are usually preceded by warm, southerly winds that are taking up moisture as they flow northerly. Certain phenomena are brought about by increasing moisture and other factors, and hence are good rain indicators. Some of them are: Sweating walls, sidewalks, metal plates, and dishes; tightening of ropes, shortening of guitar strings, tightening up of curls, softening of moss, tobacco, and corn fodder; increase in the perfume of flowers, as well as of the offensive odors from drains and ditches.

Long-Range Weather Forecasts

All weather forecasts for more than a week or ten days in advance are usually based on seasonal or average conditions, and should seldom be given serious consideration.

OLD-TIME FALLACIES. The color of the goosebone, the thickness of corn husks and of the fur of animals, the store of nuts laid up by the squirrels, etc., all show the effect of *past* weather and are in no way indications of future conditions. Forecasts for days, months, or seasons based on the weather of special days, as well as those based upon the conjunction of the planets, the appearance of the moon, etc., cannot stand the test of verification. Sunspots have no direct effect upon the weather; and there is no established relation between the moon and the weather. While there is a saying in the South that "chickens should be picked in the dark of the moon," no one considers this an indication that any consideration should be given to the position of the moon in any farm work.

FORECASTS BY THE WEATHER BUREAU. The forecasts issued by the Weather Bureau are based on twice daily telegraphic reports from several hundred places in the United States and other parts of the northern hemisphere. They are made for definite locations and periods, and are correct 90 per cent of the time.

The forecasts sent out at about 9 A. M. (75th meridian time) are based on the weather map showing the prevailing conditions at 8 A. M. throughout the country. These cover the probable conditions for the next 36 hours and are widely distributed by mail, telephone, and telegraph at Government expense. The forecasts issued at about 9 P. M. are based on the 8 P. M. weather maps, and cover the expected weather for the following 48 hours. On Saturdays a general forecast is issued for the following week.

Hundreds of thousands of people are getting the daily forecasts and special warnings of the Bureau who have found that the man who does not take advantage of this important information puts a big handicap on his operations. Fair weather forecasts for harvesting alfalfa; cold, stormy weather in the sheep lambing and shearing season in the far Northwest; flood and high-water warnings along the rivers; fire weather warnings in the great forests; warnings of high winds, gales, and hurricanes along the coasts; special temperature forecasts for shippers of perishable products; heavy snow and cold-wave warnings for transportation and other interests; frost warnings for tobacco fields, cranberry bogs, sugarcane plantations, citrus groves, and for thousands of fruit orchards where action is being taken to protect the tender blossoms by orchard heating, are only a few of the special forecasts and warnings widely disseminated by the Weather Bureau.

Rain

The temperature determines the amount of invisible moisture that the atmosphere can maintain, and at a temperature of 40 degrees F. it cannot contain more than half as much water vapor as it can at 60 degrees. Almost one-half of the total water vapor in the whole atmosphere is within one mile of the earth's surface.

A room 20 x 20 feet and 10 feet high contains 4,000 cubic feet of air. If this air is completely saturated at a temperature of 80

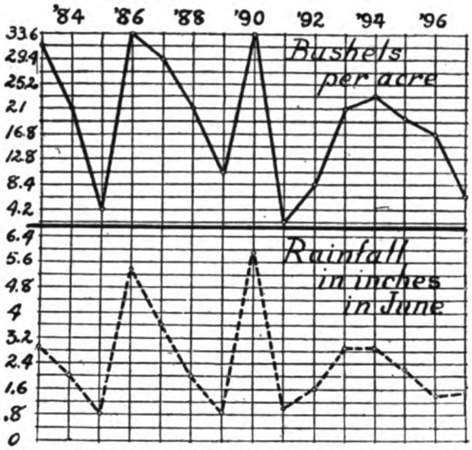


FIG. 321. The relation between the rainfall in June and the yield of oats as observed at a Russian experiment station over a period of years. Oftentimes the distribution of the moisture supply is fully as important as its total amount. (International Institute of Agriculture.)

degrees, there would be 3 quarts of water in it. If the temperature should be lowered to 60 degrees, one half of the moisture would be condensed and deposited on objects in the room, and the water vapor or invisible moisture would amount to only 3 pints. If the temperature should be reduced to zero, the amount of water vapor that the air could contain would represent less than 0.3 of a pint of water.

Rain is caused, then, whenever a large mass of air is cooled below its dew point or temperature of complete saturation. Clouds are formed just as soon as the dew point is passed, and if the cooling is continued, large drops will be formed and will fall to the earth as rain.

When a mass of air is carried to higher altitudes by any cause, it expands and, until it reaches the temperature of complete saturation, it cools at the rate of one degree for every 180 feet of elevation. If a current of air with a temperature of 80 degrees and three-fourths saturated with moisture, is forced to 10 times 180 feet, or a little more than one third of a mile, some of the moisture will be condensed into clouds and rain.

Ascending air, then, is cooling, its capacity for moisture is decreasing, and clouds and rain may result; this is the principal cause of rain. Wherever large masses of warm moisture-laden air are carried up over a mountain side or forced up in a cyclonic area or local thunderstorm whirl, heavy rains may be expected. These areas of heavy rainfall usually move easterly with the general storm movements, but whenever for any reason the center of the rapidly ascending currents of air remains nearly stationary, excessive local rainfalls occur and floods are caused.

Meaning of rain. A rainfall at the rate of one inch an hour is considered excessive; one inch of rain is 27,154 gallons or 113 tons per acre. Two and one half inches of rain in 24 hours is an excessive rainfall; this equals 67,885 gallons of water on each acre. A rainfall of 1 to 3 inches during a heavy summer thundershower is not unusual. A moderate rainfall would be one of one half to three fourths of an inch. A fall of less than one fourth inch is of little or no benefit to any well-rooted crop, especially during a dry spell.

Thunderstorms occur only where there is a rapidly rising current of moisture-laden air, and wherever convection currents are frequent, thunderstorms are also frequent. They are most apt to occur in the hottest time of the year and in the warmest part of the day. In the United States, the average number of days with thunderstorms each year is 60 in the Gulf States, 50 in Missouri and eastern Kansas, over 30 in most of the Great Central Valley districts, and less than 20 in New England, upper Michigan, and the Rocky Mountain States; they are very rare on the Pacific Coast.

After saturation has been reached, condensation goes on rapidly in an ascending current of moist air, and during this condensation electricity accumulates with marked rapidity. As clouds form in this ascending current, different clouds or different parts of the same cloud will be charged with different kinds of electricity.

The atmosphere between the earth and clouds is a poor conductor, especially in cloudy and rainy weather. The strong electric charge in the lower part of the thunderstorm cloud, as it moves along above the surface of the earth, causes the opposite kind of electricity to accumulate in the earth's surface beneath it. As a result great changes in potential are caused which may result in a violent discharge of electricity between the cloud and the earth which is known as lightning. Hence lightning may be defined as an "electric spark on a tremendous scale." Discharges of electricity take place more frequently between different parts of the same cloud than between the cloud and the earth.

The object of a lightning rod is essentially to provide a safe path for the lightning when

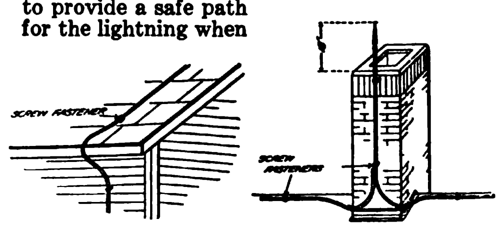


FIG. 322. Correct methods of arranging a lightning rod on, and attaching it to, a building. (Farmers' Bulletin 842.)

the electric potential between the cloud and the earth reaches the breaking point, and a violent discharge takes place. That a properly installed lightning rod will furnish a safe path for this discharge of electricity, is shown from a large number of statistics on lightning damage. With an equal number of rodded and unrodded buildings in a community, lightning will damage 9 unrodded buildings, on an average, for every 1 that is rodded. In some districts this ratio is as high as 99 to 1.

It is neither difficult nor expensive to properly rod a farm building. The important things to remember are that points or lightning rod connections must extend above all roof projections, and a continuous downward circuit be established from these points to permanently moist soil below. Farmers' Bulletin 842 gives excellent information in regard to putting up lightning rods.

Climate

The Weather Bureau maintains a large number of meteorological stations in each state, and the average rainfall and temperature values have been determined for each month and year, as well as the dates of frosts, length of the growing season, etc. The Office of Farm Management of the Department of Agriculture has prepared charts showing the necessary growing days for various crops. If one wishes to know the relation between the climate and weather on the one hand and the development of crops and of farm activities on the other in any part of the country, letters of inquiry should be sent to these offices.

Some Things Worth Knowing

That frost does most damage on low ground and that gardens and tender fruit crops should be set on the hillsides so as to get good air drainage.

That it is practicable to protect fruit and garden crops from frost damage by building small fires of oil, coal, or wood at the rate of from 50 to 100 per acre, and that by means of such fires, it is possible to keep the temperature in the heated area from 5 to 15 degrees higher than that outside. Plans must be laid carefully, however, so as to have plenty of heaters, fuel, and labor.

That wire fences should be grounded every fourth or fifth post to prevent loss of stock by lightning running along the wires.

That the climate is not appreciably changing, notwithstanding the memory of the oldest inhabitant to the contrary.

That the words "fair," "change," "rain," "stormy" on the dial of the aneroid barometer have little or no significance, and not only cannot be depended upon but may be very misleading.

That it is possible by the science known as Agricultural Meteorology to determine the weather factor having the greatest influence in varying the yield of the various crops, as well as the most critical period of development.

That in a record in Ohio covering 60 years with each variation in the rainfall during July of one-half inch, near the critical rainfall point, there was an average variation of the yield of corn amounting to 15,000,000 bushels.

That when the rainfall for July over the 8 great corn states has averaged more than 4.4 inches, the yield of corn has averaged greater by 500,000,000 bushels than when the rainfall has been less than 3.4 inches.

That "rain making" is a fake. That neither can tornadoes be broken up by firing cannon nor hailstorms dissipated by shooting hail guns.

That among the business risks of farming, those that grow out of unfavorable weather conditions are of greatest importance, and that no type of agriculture can be successfully es-

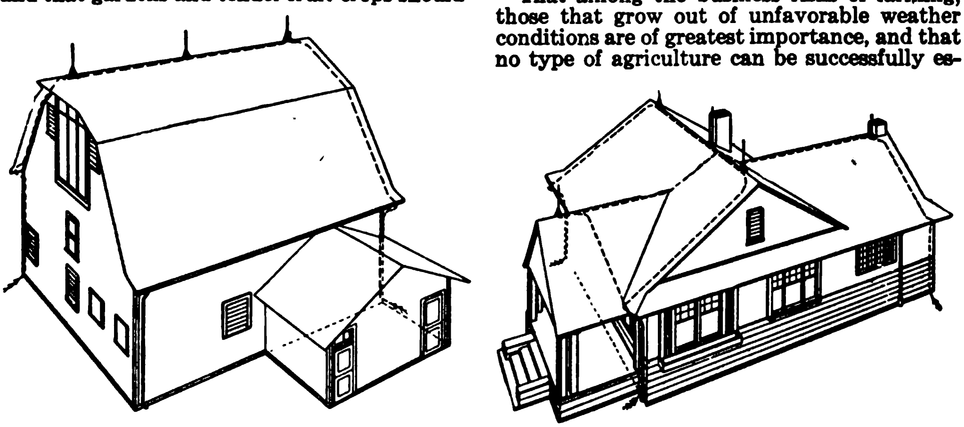


FIG. 323. Effective wiring systems for the protection of a barn and a farmhouse. The highest point of the rod should extend at least eighteen inches above the highest point of the building; the course of the wire should be as direct and free from sharp turns as possible; and the ends should be grounded deep, preferably in permanently moist soil. (Farmers' Bulletin 842.)

Fig. 324. Average annual rainfall in the United States. The line connecting places receiving 20 inches corresponds closely to the 100th meridian (see Fig. 320), which may, therefore, be said to mark the division between the humid and arid sections of the country. Note the heavy precipitation along the North Pacific Coast caused by the action of the mountain ranges on the warm moisture-laden winds from off the ocean. (U. S. Weather Bureau.)

tablished in a region where the risk of loss by drought, frost, or other unfavorable condition is not more than balanced by the profits at other times.

The Atmosphere

We travel upon the land and a large proportion of our food is derived from it; we sail about upon the surface of the water and transport important articles of commerce and of food from one continent to another.

We live, however, at the *bottom* of the atmosphere and move about in this gaseous ocean with often little thought of its importance to us or appreciation of the fact that, without the atmosphere, all life would cease to exist on the earth in a very few hours.

Clean, dry air appeals so slightly to any of our senses that we forget its presence until it affects us either favorably or unfavorably in a well-defined manner. Not only is the atmosphere essential to our very life, but the gases that make it up are mixed in the right proportion to be of greatest service to us.

COMPOSITION OF THE ATMOSPHERE. Slightly over three fourths (78%) of the atmosphere is composed of nitrogen, while not quite one fourth (21%) is composed of oxygen; approximately one per cent is made up of various gases some of which are very rare. Mixed with the atmospheric gases there are a vast number of dust particles and bacteria, also water in the form of vapor amounting on an average to from one to five per cent of the total weight of a given volume of air. All the main constituents of the atmosphere are essential to our wellbeing.

Nitrogen is a comparatively rare element in the earth, but it furnishes one of the most important elements in plant food, and by diluting the oxygen, it diminishes the activity of combustion.

Oxygen in chemical combination with hydrogen constitutes eight ninths, by weight, of pure water and combined with other elements it composes nearly 50 per cent of the crust of the earth. It, like a politician, is a good mixer and combines readily with other substances. It is absolutely necessary in the burning of fuel as well as in that form of combustion which takes place in the lungs of air-breathing animals. It is interesting to note that, if the proportion of these two gases should be varied, life would be far different than it now is. With a slightly larger percentage of nitrogen we should be dull and stupid, but with an increase in the proportion of oxygen we should be full of life and energy and sparkling with wit and brilliancy.

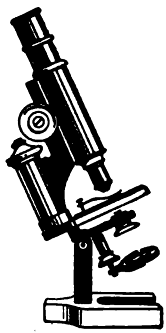
Carbonic acid, although averaging only about 0.035 per cent by volume of the atmosphere in the open country, is as important in sustaining vegetable life as oxygen is in connection with animal life. As it is 1.5 times as dense as an equal volume of air, it collects in mines, sewers, old wells, and other low and confined places, and replaces the gases which are necessary in life. Fortunately its presence in dangerous quantities can be determined by its failure to support active combustion, hence one should never go down into an old well or similar low confined space without first letting down a lantern or lighted candle. If the light continues to burn freely, the place is safe, but if it is extinguished or burns dimly, one should not venture down without a gas mask or apparatus for breathing prepared oxygen.

Water vapor is not important in volume but it is essential for vegetation. It furnishes an important link in the chain of moisture circulation, from the surface of the ocean and other large bodies of water by evaporation into the atmosphere, there forming clouds and rain, watering vegetation as it falls and making up the brooks, streams, and rivers on its way back to the oceans that are so important in our economic operations.

HEIGHT OF THE ATMOSPHERE. Water can be brought from a well by a pump from a depth of between 30 and 34 feet because the weight of the air upon the surface of the water equals that of the same area of water 34 feet in height at sea-level. The pressure of the atmosphere amounts to 15 pounds per each square inch of our body surface. As the gases that make up the atmosphere are very elastic, they are greatly compressed near the earth by the weight of the air above so that one half of the whole atmosphere is within 3½ miles of the earth's surface at sea-level. At 10 miles' elevation, the air is not dense enough to transmit sound.

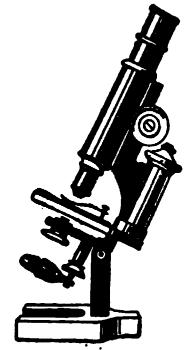
While more and more knowledge is being gained of the lower atmosphere, little is known of its vast upward expanse. The highest that man has ever gone on a mountain side is not quite 4½ miles (23,490 feet) and there the air was so rare that breathing was difficult and extreme exhaustion was experienced with even the slightest movement. The highest point ever reached by man in balloons is less than 7 miles and then unconsciousness resulted except when prepared oxygen was inhaled. Meteorological instruments have been carried by kites to the height of 4.5 miles (23,800 feet), and by sounding-balloons to the extreme height of 20.2 miles.

A sufficient number of sounding-balloon observations have been made to show that the lowest temperature is some 6 or 7 miles above the surface of the earth where it averages between 60 and 70 degrees F. below zero. From twilight observations and the fact that meteors become luminous by friction with gases at an elevation of 180 to 200 miles, there must be an appreciable amount of some of the gases of the atmosphere at that height above the earth.



CHAPTER 17

The Science of Chemistry



By H. F. BUTTON, *head of the Department of Farm Crops and Soil Fertility of the New York State School of Agriculture at Farmingdale, Long Island, where he has charge of the 308-acre farm devoted to the teaching of practical agriculture. He was born and raised on a large live-stock and grain farm (which he now owns) near Canastota, New York, and is a graduate of the State College of Agriculture at Cornell University, where, as he says, he "learned the reasons for the facts and practices he already knew from experience." He has combined the teaching of agriculture in school with the giving of practical farm advice, as well as coöperative organization, corn breeding, cow testing, and other rural work. He organized, and was for 6 years Principal of, the Agricultural High School of Manassas, Va., where, incidentally, he aroused, organized and stimulated the farming of the whole neighborhood. As a result of this work the number of farmers growing pure strains of corn increased from one per cent to about ninety; and the practice of cow testing increased to much the same extent. Later he organized the agricultural department of Vincennes University, Indiana, with which he remained for 2 years. He is a specialist in soil fertility and the raising of general farm crops and farm animals. His long experience with practical farmers and their problems, especially qualifies him to treat of technical problems in a practical manner.*—EDITOR.

CHEMISTRY is nothing more nor less than a knowledge of what things are made of, and of how the different parts go together.

More than all the other sciences together, chemistry has made the modern farmer what he is. Chemistry has ended the day of moon signs, sorcery, uncertainty, squalor, small yields, decreasing fertility, and general misery, and has given in their place fertilizers of known composition, accurate knowledge of plant needs, increasing yields, prosperity, and, above all, a feeling that the farmer is master of his job.

In spite of this, most farmers think that they know nothing of chemistry, and mentally "shy out" when a chemical term is used. Many men who have a fair working knowledge of the friction of pulleys, of flow of water in pipes, of cross pollination, and of serum treatment think that they cannot understand the tag on their fertilizer sack or a price quoted on a high-protein cattle feed.

Yet the fact is, that every farmer is a chemist; his success depending largely upon how well he understands the laws which govern the science. When he puts water on lime to make whitewash he practises chemistry; when he mixes land plaster in his hen manure, or refrains from putting in ashes, he is practising the applied art of chemistry. Even more is this the case when he buys fertilizer, makes a spray, boils sulphur with lime, tells his wife that the milk at the creamery tested 3.4, or when he selects cattle feeds according to their composition. His wife is a chemist of no low order when she mixes soda and sour milk, or takes out a stain with lemon, or blacks her stove before setting it away for the summer. Either he or she may do these acts without knowing why, in which case they will be mere followers of those who do know; but, skilled or unskilled, the farmer must be a chemist, whether he wishes to or not.

In fact, chemistry is just as easy to understand as any other of the problems which we have to face. Anyone who can understand a grain binder, or

A farmers' club meeting at the home of one of the members. One way to become a better farmer is to study and talk over the other fellow's methods and results

A community field day and picnic is a good chance to get acquainted with your neighbor. As Sam Jordan of Missouri says, "You might like him!"

EVERY TIME FARMERS AND THEIR FAMILIES GET TOGETHER—WHETHER FOR WORK OR PLAY—THEY STRENGTHEN THE BONDS AND INCREASE THE USEFULNESS OF THEIR COMMUNITY

The country road of yesterday that leads, as such roads must ever lead, to ignorance, poverty, and wretchedness

The roadway of to-day is a path of progress, bordered by good farms and good schools, and sharing their benefits with those that use it

The Roads of a Community Are the Links That Bind it to the World Outside, as Well as a Measure of Its Intelligence, Progress, and Prosperity

an automobile, or can breed good cows, or manage a general farm can easily understand as much of the elements of chemistry as is essential to make him or her master of the farm or of the household.

It was not long ago that men thought that heat was a substance that escaped when a stick burned; but now we know that it is a result of chemical action or motion. When a chemical change takes place, heat is always given off or taken up. The burning of coal and the decay of manure are familiar examples of the giving off of stored heat; while the growth of the plants stores up a vast amount of heat taken from the sun, to be later used in supplying us or our animals with heat or energy. Thus chemistry treats of both the matter and the energy of our lives.

The Language of Chemistry

Elements. When we studied English grammar, we learned to take a sentence apart; and when we had it all in pieces, we called these fragments the "elements," because the subject and verb were just that, and not even the ingenuity of a grammarian could make them into anything more simple. So, when we take a substance all apart, we call the parts "elements," because they cannot be separated into anything simpler. For instance, we take the wires connecting the terminals of dry batteries and pass the current through water containing a little salt, to make the water conduct the current. The water is changed slowly into two gases; one of these will burn, or, if the two are united, they will explode violently. Both of these gases are elements—oxygen and hydrogen. In another way we can take table salt and break it up into the metal sodium and the poisonous gas chlorine. Anything composed of one kind of matter alone is an *element*, and anything having more than one kind of matter is a *compound*. There are only about eighty elements. Of these not more than twenty-five are of great interest to the farmer, and only a dozen or fifteen take any part in the growth of his plants and animals.

Symbols. Since a chemist is as busy as a farmer and has to write them down very often, he has acquired the habit of abbreviating the names of the elements, often making a single letter stand as a symbol of a word. Thus two of the most common elements are oxygen (the symbol of which is O) and carbon (symbol, C). When one part of hydrogen (H) combines with one of chlorine (Cl) we write it HCl, or, if one part of iron (Fe) combines with one of oxygen (O), we write it FeO. Thus these chemical expressions, or *formulas*, which so often make people afraid of the science, are really an advantage, as they tell just what is in the substances they refer to.

If more than one part of an element combines with a part of another, we show the fact by a small figure following, and below the line, as H_2O for water, or CO_2 for carbon dioxide, or NH_3 for ammonia, or $CaCO_3$ for limestone, or H_2SO_4 for sulphuric acid, which is used in making fertilizer and testing milk.

COMMON ELEMENTS WITH THEIR SYMBOLS, VALENCES, AND WEIGHTS

Element	Symbol	Valence	Weight
Aluminum	Al	3	27
Arsenic	As	3 and 5	75
Bromine	Br	1	80
Calcium	Ca	2	40
Carbon	C	2 and 4	12
Chlorine	Cl	1	35
Copper (Latin *cuprum*)	Cu	1 or 2	64
Gold (Latin, *aurum*)	Au	1 and 3	197
Hydrogen	H	1	1
Iodine	I	1	127
Iron (Latin, *ferrum*)	Fe	2 and 3	56
Lead (Latin, *plumbum*)	Pb	2 and 4	207
Magnesium	Mg	2	24
Nitrogen	N	3 and 5	14
Oxygen	O	2	16
Phosphorus	P	3 and 5	31
Potassium (Latin, *kalium*)	K	1	39
Silicon	Si	4	28
Sodium (Latin, *natrium*)	Na	1	23
Sulphur	S	2, 4, and 6	32

Molecules and atoms. All substances may be divided into smaller and smaller pieces, but their identity remains the same. If you take a piece of lime rock and break it into pieces like stove coal, it is still lime rock; nor does it change it if you grind it into a fine powder. There is, however, a still finer-sized particle beyond which we cannot go and have it remain limestone; this we call a *molecule*. It is composed, as the formula ($CaCO_3$) shows, of 1 *atom* of calcium, 1 atom of carbon, and 3 atoms of oxygen. If we break up this group, as when we burn lime-

stone, the separate parts have entirely different properties from the whole.

Weights. It is unfortunate that both molecules and atoms are too small to be seen, but their behavior leads us to adopt many positive rules as to their character. We are sure that no two kinds of atoms weigh the same, but that all atoms of any one kind are exactly alike. As they are so small, we do not attempt to actually weigh them, but only say that an atom of carbon weighs 12 times as much as one of hydrogen (the lightest known substance), that an atom of oxygen weighs 16 times as much as one of hydrogen, etc. (see table, p. 365).

Valence. While we cannot see the atoms or molecules, we may help ourselves by thinking of atoms as being cubes, like dice, equipped with hooks, with which they fasten on to one another to form molecules. Some, like hydrogen and chlorine, have only 1 hook; many, like oxygen, have 2 hooks; others, like nitrogen and phosphorus, have 3 hooks; and yet others, like carbon, have 4. This ability to hook up or combine is called "combining power" or *valence* (see table). Thus, a carbon atom, having a combining power of 4, will hook on to 2 atoms of oxygen each of which has 2 bonds of union. If the carbon atom has only one atom of oxygen hooked up, as in carbon monoxide (or CO), we may think of it as having 2 hooks free to grab other things and we know that it is an inflammable, dangerous gas; the carbon atom in carbon dioxide (CO_2), on the contrary, having all 4 hooks occupied, is a stable or strong compound, which will not burn or explode.

Combinations. Chemical elements have many ways of differing from each other. Like people, they have strong likes and dislikes. Oxygen has a strong liking or *affinity* for a number of the elements, and makes such strong compounds with many of them that it is difficult to separate the resulting compounds into their constituent parts. Nitrogen is almost the opposite of oxygen in its characteristics, and has aptly been called "the lazy element"; for it is unwilling to combine, and all its compounds are most unstable and readily come apart again. This unwillingness to combine especially fits nitrogen to be the principal constituent of gunpowder and other explosives, and of living things, in which there must be constant chemical change.

Radicals. Besides the individual atoms, there are certain groups of atoms which form partnerships or associations, which act like single atoms, going out from one compound and into another without losing their identity. These groups are called *radicals*, and might be compared to married couples or families whose relations to each other are stronger than their business associations with others. Among them, and of especial interest to farmers, may be noted the following: the radical OH, which is found in all bases, such as lime or caustic soda; the radical SO_4, found in sulphates; the radical NO_3, the form in which nitrogen is used by plants; and the radical P_2O_5, the most common source of phosphorus. When written, these radicals are often indicated by being enclosed in parentheses, as in $Ca(OH)_2$, the formula of calcium hydroxide.

Acids and salts. Compounds of a sour taste which contain hydrogen are known as *acids*. Some, such as nitric, sulphuric, and phosphoric, which are strong mineral acids, are very important. Others, such as the acetic acid of vinegar, the lactic acid of sour milk, the malic acid of the apple, and the citric acid of the lemon, are useful in our food. When one of these acids combines with a *base*, that is, a compound made of the radical OH and one of the metal elements such as iron, zinc, sodium, etc., the product is called a *salt*, without regard to its being "salty" to the taste. Thus, if nitric acid is put on caustic lime, nitrate of lime is formed; or, if soda is put in sour milk, the lactate of soda remains in the milk.

The Chemistry of the Soil

A proper control of the chemical composition of the soil is the most important factor of permanently successful agriculture. Dr. Liberty H. Bailey gives as one of the four qualifications of a good farmer that he leave his farm in as good a state of fertility as he found it, or better. Farming is an exception to the rule that we cannot eat our cake and still have it; for, after a farmer has taken as many crops from a field as a conjurer takes articles from a silk hat, he may leave it, if he knows how, richer than he found it.

Despite this alluring possibility, it is true that agriculture usually declines. Low yields were the rule all through Europe in medieval times, and George Washington wrote to an English friend of the worn-out soils already common in northern Virginia. Every well-informed farmer knows that many, if not most, of the soils of the United States have declined in fertility, although we here and there find brilliant exceptions to the rule. Too often the American farmer agrees with the elderly farmer from a middle-western state who refused

to listen to a teacher of agriculture, saying, "You can't tell me anything about soil. I have worn out two farms already."

In western Europe, we find the crop yields about double the average of those in the United States, and, what is more significant, the last 60 years have seen an improvement there about equal to our total yield per acre. In Rome in the first century A. D., the yield of cereals was but fourfold, or 8 to 10 bushels per acre.

Many facts could be cited to prove that we have not yet adopted a permanent system of agriculture in the United States and that other countries with older soil have better methods. It is true that more labor is expended on crops in Europe than in America, but this is more than offset by our use of better machines and more horses and by the newness of our soil. The larger yields of European farms must be credited to the fact that the farmers feed their soil much more generously and skillfully.

Two centuries ago, farmers thought that the soil itself entered and fed the plant; but the true facts were most clearly set forth by Liebig in 1859, when he said, "It is not the land itself that constitutes the farmer's wealth, but the constituents of the soil which serve for the nutrition of plants." Wherever this principle has been heeded, and the soil fed freely with the necessary elements, progress has been steady. Previous to that discovery the average farmer knew nothing of purchased or commercial fertilizers; since then the fertilizer trade in America alone has grown to $100,000,000 a year.

Events from 1914 on have demonstrated the imperative need of increased crop production. This can be secured by one or both of two methods: (1) we can increase our acreage by the use of still more labor-saving machinery and extensive methods; or (2) we must raise more to the acre. That most of the desirable crop land is now in cultivation is shown by the fact that the acreage of land in farms is almost stationary, so that any great increase of crops must come about as a result of better fertilization and more intensive methods.

In order that we may take stock of what materials we have in our soil, and of what materials we need in our plants, we may set down in parallel columns the chemical elements of each class in the order of their abundance:

In the Earth's Crust		Needed by Plants	
Element	Per cent	Element	Approximate per cent
Oxygen (O)	47.17	Carbon (C)	45.0
Silicon (Si)	28.00	Oxygen (O)	42.0
Aluminum (Al)	7.84	Hydrogen (H)	6.5
....	....	Nitrogen (N)	1.5
Iron (Fe)	4.44	Potassium (K)	2.0
Calcium (Ca)	3.42	Calcium (Ca)	1.0
Potassium (K)	2.49	Phosphorus (P)	.5
Sodium (Na)	2.43	Sulphur (S)	.4
Magnesium (Mg)	2.27	Magnesium (Mg)	.4
Hydrogen (H)	.23	Iron (Fe)	.04
Carbon (C)	.19	Sodium (Na)	.4
Sulphur (S)	.11	Chlorine (Cl)	.6
Phosphorus (P)	.11	Silicon (Si)	2.00

It will be seen that nitrogen does not occur in the earth's crust. However, the plant secures this element, together with its carbon, indirectly from the air, while water supplies the oxygen and hydrogen it requires. The three last-named elements in plants, namely, sodium, chlorine and silicon, are not considered necessary to their growth; and iron, magnesium and sulphur are seen to occur in soils in sufficient abundance. This leaves, therefore, only 4 elements, namely, nitrogen, phosphorus, potassium and calcium (or, as its compounds are called, lime), which must frequently be supplied in order to bring the amounts in the soil up to the point required to meet the needs of plants.

As these elements do not form more than 3 pounds in 100 of a green plant, many feel like a farmer friend of mine, who said that, if nature gave 98 pounds, he would be a stingy man to begrudge the other two. However, to supply even those intelligently, we should know as much as possible of what is in the soil and how much is removed by the crops grown upon it.

Chemical analysis. For upward of 50 years it has been the dream of the chemist and farmer alike that the soil could be analyzed, its precise needs determined, and the necessary fertilizer added to give any desired effect. Many people still believe this to be possible, and submit samples of soil for chemical analysis. It is no more possible to reduce

our farming to a formula than it is to have a doctor sample our blood and give us an absolute specific for all body ills. On the other hand, we can no more declare chemical analysis to be worthless than we can dispense with the doctor's diagnosis.

Since soil is mostly rock fragments and plant remains, and because certain rocks are widely scattered and abundant, it follows that a great many soils of differing farm values are very much alike in composition. Their differences are due to site, contour, exposure, hilliness, climate, rainfall, distance from market, etc. Moreover, there are great areas of soils so similar in origin and quality as to be classed as *soil types*, many of which have been carefully studied and their characters and wants fully shown.

Any soil which is in any way notable for richness or for unproductiveness will usually show the reason in its composition, and to the shrewd and resourceful farmer, suggest, on the one hand, its adaptability or, on the other hand, a suitable remedy for its condition.

If any element is really lacking, chemical analysis will show the fact and the remedy; but, if all essential elements are present in abundance, then the farmer must devise some physical means of making the soil productive, by tillage, drainage, irrigation, etc.

The soils of many large sections of the country have been studied, classified, and mapped (see Volume II, Chapter I); and the resourceful farmer should learn through the Bureau of Soils of the United States Department of Agriculture, what is actually known about the soils of his immediate neighborhood.

In general, it may be said that most of the country east of the Appalachian Mountains lacks lime, and much lacks phosphorus also; while little, except swamp land and muck or coastal plain sand, is in need of potash.

The soils of the central states need phosphorus most, and in many places need lime to a slightly less degree. West of the Mississippi River, water is more often the limiting factor than any one of the fertilizing elements.

LIMITING FACTORS. With a knowledge as to the composition of the soil and the plant, it is apparent that though proper culture be given, and rain and sun be normal, there will be in all probability some one of the necessary plant foods which the plant fails to secure in proper amount. This is called the *limiting factor*. It often occurs that an inexpensive substance thus limits the yield, which can then be increased to a profitable figure at slight expense.

It may be, for example, that there is in a soil plenty of everything for a 30-bushel wheat crop except phosphorus, but of this one, necessary element there is only enough for 15 bushels. The wheat is, therefore, unable to exceed this limit, while a small application of a phosphate fertilizer will raise the yield. At this point, perhaps, lack of available potash or nitrogen becomes the hindrance to still further development.

I have seen Indiana river bottoms where the purchase of phosphorus for grain gave an increase of 1,000 per cent of the cost; but at this point nitrogen became the limiting factor, and, at market prices for the grain and fertilizer, a yet larger crop was produced at a loss.

It is the farmer's business to find the limiting factors and to raise the yield to just the point where further gain costs more than it is worth. Such a limit is readily reached, and, when found, should not be exceeded until a rise in the price of the product sets a new one.

For example, with wheat at 80 cents a bushel, there is no incentive to apply fertilizer to wheat; at $1 a bushel, some phosphorus may be profitably used; but with wheat at $2 a bushel, a much larger amount of complete fertilizer, containing nitrogen, phosphorus and potash, will have a profitable result. Under normal conditions of soil, crop, and price, a farmer should keep his soils supported with the necessary lime, phosphorus, and potash for full yields, allowing nitrogen to be the limiting factor, and supplying only as much of this element as can be secured by crop rotation and the careful use of farm manures.

NITROGEN. The reason for making nitrogen the limiting factor of farm crops is that it costs from 4 to 6 times as much per pound as potash or phosphorus, besides which it cannot be stored in the soil in an available form. With the market price of nitrogen from 20 to 30 cents a pound, we should carefully consider the problem from all standpoints.

Nitrogen occurs free in the air in great quantities, there being, at market prices for the nitrogen fertilizer, more than $50,000,000 worth above each acre. Because nitrogen is so inert or lazy, this supply is not at all available to most plants, and only slightly available to the legumes until it is fixed or fastened down in compounds.

In ordinary soils, nitrogen occurs in amounts varying from 200 or 300 pounds to the acre in poor sandy soil, up to 8,000 or 10,000 pounds in very fertile, new, prairie soils. This is in the form of partly decayed plants or other organic matter, and not over 2 or 3 per cent of it may become available during a crop-growing season. There are nitrogenous fertilizers of many sorts on the market, differing in their content of nitrogen and in the readiness with which it is available. If the material comes from animal or plant, it is called "organic"; if not, "inorganic."

Nitrate of soda. Of the materials used, the principal one is nitrate of soda, in which the nitrogen is the most quickly available. This is the great stand-by of gardeners and others who wish quick results, as it penetrates deeply into the soil, is more fully recovered than other forms, and leaves the soil less acid by reason of the residue of soda. Nitrate of soda contains about 16 per cent of nitrogen, and is

often used on wheat and grass as well as on garden vegetables. It hastens growth, but often delays maturity, so it should be used at the beginning of the season and in small amounts. From 100 to 200 pounds per acre is often used on grass and grain, while intensive gardeners may find it profitable to use 400 pounds to the acre in 3 or 4 applications. It is usually applied broadcast, and never plowed under.

Sulphate of ammonia. This contains 20 per cent of nitrogen, and is a by-product of gasworks. It is not widely used in this country, although it is richer in nitrogen than any other material. It leaves the soil acid, and is not so fully recovered by plants as nitrate of soda.

Dried blood. The favorite of skilled truck gardeners is dried blood, as it is almost as quickly available as nitrate of soda, and is not so quickly washed out of the soil by rains. Its effect on the soil is excellent and it does not harm the plant. It is usually spread and harrowed in before the crop is planted, but in growing potatoes it is usually applied in the row with the seed.

Tankage and dried fish. These dried animal products contain phosphorus in addition to 6 or 8 per cent of nitrogen. Both are good for corn, as the food becomes available gradually rather slowly throughout the season.

Legumes and nitrogen. All of the above mentioned sources of nitrogen are high in price, limited in quantity, and temporary in their effect, while the great source of nitrogen, the air, remains untouched. Nearly every farmer knows that certain plants (legumes), as the pea, lupine, clover, alfalfa, vetch, and bean, leave the soil richer than they found it. I have raised 3 crops of alfalfa a year for 15 years on a field without manure, and at the end of the period have found it richer, as shown by its ability to raise better corn, than it was at the beginning. When soil is baked to kill all bacteria, a legume grown in it has no more power to take nitrogen from the air than has wheat or cabbage, but must take the supply of nitrogen from that already in the soil, leaving it the poorer. On the other hand, if the right kinds of bacteria are present, and the soil has the necessary minerals, the legume forms a partnership with the bacteria, in which the plant provides a shelter and plenty of nutritious sap containing some of the sugar made in the leaves, while the bacteria draw from the air of the soil nitrogen enough for themselves and some over to pay for their lodging. The presence of these bacteria may be known by the swellings or nodules on the roots of the legume. These nodules are not the bacteria, but merely swellings of the plant tissue within each of which thousands of the bacteria live.

It is important to know that bacteria from red clover are of no value to alfalfa, neither are those of beans capable of fixing nitrogen in soy beans or vetches. If a certain legume crop has been long and successfully grown, there is small chance of the soil lacking the proper strains of bacteria; but if a new crop, as soy bean or vetch or alfalfa, is introduced, some provision should be made for inoculation with the proper bacteria, to enable the new plant to fix nitrogen.

Soil inoculation is no more mysterious than putting yeast in bread, and is more easily done by any one of several ways. Several reputable companies, as well as many of the state experiment stations, now send out pure cultures on sand or in gelatine which may be mixed with the seed just previous to sowing. After this has been done once, the effect seems to be permanent, and there will still be plenty of bacteria when the crop is sown again. A useful method employed by many farmers is to go to some field where the crop is growing and take a quantity of soil amounting to 100 or 200 pounds for each acre they wish to sow. This soil should be sown on the field on a cloudy day or just at sunset and promptly harrowed in, as exposure to bright sunshine for even a few minutes will kill the bacteria in the soil as surely as it will those in a dairy utensil. Either of these methods will repay the labor and cost many times over.

The amount of nitrogen fixed from the atmosphere by an acre of legumes is usually given at from 40 to 160 pounds, but in some cases it is certainly higher. In the alfalfa field on my own farm (of which I spoke above) the amount removed in the hay was at least 50 pounds per ton (or 200 pounds per acre) a year for 15 years; and, as the crops and color of the soil showed as much nitrogen at the end of the period as at the beginning, I feel sure that at least 200 pounds per acre was added to the farmer's supply. This agrees with some recent, exact experimental work in which it was found that a crop of winter vetch planted in a crop of cowpeas or soy beans and followed by another, added 200 pounds per acre a year, of which, if fed to livestock, three fourths might be recovered in the manure and used to grow cereals. Figured in this manner, 2 acres of cereals may be grown on the nitrogen in the manure from 1

FIG. 325. White clover plant showing root nodules containing nitrogen obtained from the air and stored up by bacteria.

acre of a vigorous legume crop. The only manner in which a farmer can hope to maintain and increase the nitrogen supply of his farm is to grow legumes on all possible areas in all the intervals between grain crops, and, after feeding them to thrifty animals, to return to the soil the entire product of the manure. While unusual prices for grain may justify the use of nitrates, yet in the long run Dr. Cyril Hopkins of Illinois is correct when he says, "The American farmer can sometimes afford to buy water to irrigate his grains, but not to buy nitrogen to fertilize them." The truck or cotton farmer may buy nitrogen with profit, but the general farmer will do well to follow the experience of the oldest agricultural countries and the teachings of the youngest experimenters and produce his own nitrogen on the farm by the aid of the friendly bacteria.

There are still other bacteria in the soil which do not live on legumes, but which have the same power of fixing nitrogen from the air. These live on decaying plants and are encouraged by stable manure, lime, good drainage, and thorough tillage. In thin, poor, acid soils they are of very little account; but in fertile, well-manured soils they may, in some cases, add as much nitrogen as those of legumes, because they are always at work.

Lime. Lime is a name which is applied to several compounds of the element calcium, with the result that many persons are confused as to their identity and value. To begin with, calcium is a light-weight, silvery white metal, much softer than iron and somewhat resembling tin in color and hardness. It is seldom seen outside of large laboratories, and has few uses. Calcium has such a strong affinity for oxygen that it readily burns, to form the oxide CaO, and will even pull the molecules of water apart to get oxygen. You will recall that oxygen and hydrogen often unite, to form a radical (OH), which acts like a single atom, leaving one compound and entering another unchanged. When calcium comes into contact with water, we may picture the water as being composed of an (OH) radical loosely fastened to one atom of hydrogen, or $H\,(OH)$ (instead of H_2O, the usual way of writing it). The hydrogen is given off as a gas, and the calcium atom combines with two of the (OH) radicals to make slaked or hydrated lime, $Ca(OH)_2$. This form of lime is an active, soluble base, or alkali, with the power to combine with and neutralize all acids. One of the most abundant acids in nature is carbonic acid, or carbon dioxide, which combines with this caustic lime and forms a salt of lime which we call "carbonate" ($CaCO_3$).

I have now traced through from the metal the principal compounds of lime, to show their relation to each other; but the manufacture and application of lime begin with the carbonate and go the other way. When we quarry limestone, it is a carbonate of lime, $CaCO_3$, often mixed with carbonate of magnesium, $MgCO_3$, a substance with rather similar properties. If we heat or burn this lime rock, its molecules break up and let the carbon dioxide go off as a gas, leaving the calcium oxide as a white solid. Thus $CaCO_3$ becomes $CaO + CO_2$. If the lime rock is pure, 100 pounds lose 44 pounds of carbon dioxide by burning. Calcium oxide, or quicklime, is familiar to everyone who has whitewashed, or mixed plaster, or done disinfection on an extensive scale, or made lime-sulphur solution or Bordeaux mixture for spraying. When water is put on, the quicklime combines directly with it, giving off much of the heat which was absorbed when the limestone was burned. Thus $CaO + H_2O$ becomes $Ca(OH)_2$. Fifty-six pounds of pure quicklime takes up 18 pounds of water, making 74 pounds of caustic, or hydrated, or slaked, lime. As the calcium is unchanged, we find that 100 pounds of limestone is equal to 56 pounds of quicklime, or 74 pounds of hydrated, or slaked, lime. When this is exposed to air, which contains the usual amount of carbon dioxide, the gas is absorbed, making carbonate of lime and water. Thus $Ca(OH)_2 + CO_2$ becomes $CaCO_3 + H_2O$. This takes considerable time, but in the end the lime will become the same carbonate with which the cycle started. When lime is mixed with sand for plaster it hardens because the carbonate of lime crystals lock the sand grains together into an artificial sandstone. Water is given off when this takes place, which accounts for the dampness of newly plastered houses.

Carbonate of lime is very slightly soluble in water; but in the soil it combines with another part each of water and carbon dioxide, making soluble bicarbonate of lime, which is the most common cause of "hard water." This has much the same chemical relation to carbonate of lime that baking soda has to washing soda. When very hard water is exposed to the air and sun's heat, it often drops a part of its lime as a crust on twigs or moss, making a form of petrified moss, etc. This process partly accounts for the fact that lime washes out of a fertile soil more rapidly than other plant foods, such as potash.

A study of the weights and reactions will also show that the question of what kind of lime to buy is mostly one of which kind gives the most pounds of calcium for a dollar. No matter which kind is used, the result is much the same. The use of quicklime saves freight, because 56 pounds of it is equal to 100 of limestone; but, unless used at once, it absorbs moisture and bursts all barrels or sacks. The hydroxide has better keeping qualities and is finer than grinding can make it, but when put in the ground it soon becomes carbonate.

Not all of the chemical changes of lime are included in the above, for the element calcium seems to take an important part in

much of the chemistry of the farm. If we use sulphate of ammonia as fertilizer, we find that the molecule $(NH_4)_2SO_4$ breaks up; the NH_4 being used by the plant, and the sulphate radical SO_4 remaining in the soil as sulphuric acid. This acid makes the soil sterile unless enough lime is present to combine with the acid and make insoluble gypsum, or calcium sulphate ($CaSO_4$), just as it does in Bordeaux mixture.

It is, therefore, necessary to know the source as well as the amount of nitrogen in fertilizers, in order to replace the lime that has been made insoluble and to keep a supply available for plant food. This is not an argument against sulphate of ammonia, because nitrogen is the expensive food and lime a very cheap one. The important thing is to know what we are doing and to provide for the consequences of our actions.

Nitrate of soda has certain chemical effects directly contrary to those of sulphate of ammonia, as a study of its chemistry will show. Its formula is $NaNO_3$, of which the nitrate radical (NO_3) is used by the plant, which leaves the sodium, Na, in the soil. Now sodium, like calcium, is an alkali-forming element which decreases the acidity of the soil by that amount. If lime and sulphate of ammonia are mixed, the lime will draw the sulphate radical to itself and the gaseous ammonia will escape. This change is shown thus: $(NH_4)_2SO_4+Ca(OH)_2$ becomes $CaSO_4$, or gypsum, and $2NH_4(OH)$. Any substance that contains ammonia is affected in this way, the ammonia being driven off. Anyone who knows the odor will appreciate the "know-it-all" farmer who told me that he always mixed his wood ashes (50 per cent lime) with his hen manure. I remonstrated; but he said, "I know it makes the manure stronger, for I can smell it." The opposite effect is produced when gypsum is mixed with decaying manure. The carbon dioxide, ammonia, and gypsum unite to form carbonate of lime and sulphate of ammonia, thus: $CaSO_4+2NH_4(OH)+CO_2$ becomes $CaCO_3+(NH_4)_2SO_4+H_2O$.

Phosphorus. The element phosphorus is opposite in a chemical sense to calcium, as it is waxlike instead of metallic, and its oxides form acids instead of bases. It is more like beeswax than it is like any other common substance. It has such a strong attraction for oxygen that it will take fire in warm air and smoke in cold air, making it necessary to keep it under water. It burns readily, giving off a dense white smoke which is, of course, an oxide. This has been found to be P_2O_5, the *phosphoric pentoxide* of the chemist. This dissolves in water, making real phosphoric acid, H_3PO_4, though the name is generally applied to the dry acid or powder produced by burning the phosphorus. This acid would destroy any plant at once, so it is used in the form of a salt, or phosphate, made by combining the acid with a base or alkali. The most common one with which it is combined is calcium, in which form (phosphate of lime) it is usually found in nature. This mineral is widely scattered, forming a part of every fertile soil. It occurs in large accumulations of phosphate rock in South Carolina, Florida, Tennessee, and several of the Rocky Mountain states, but, whether in rock or in the form of bone, it is the same compound of 3 parts of lime (CaO) to 1 part of dry phosphoric acid (P_2O_5). Looking back at the weight given in the general discussion of chemistry, we find that the 3 parts of lime are slightly heavier than the phosphoric acid, making the lime six elevenths or 55 per cent of the whole, and the phosphoric acid five elevenths or 45 per cent of the whole. As found in nature, it is not often more than 60 or 80 per cent pure, bringing the actual phosphoric acid down to 30 or 35 per cent.

When found combined with 3 parts of lime or, as it is called, "tricalcium phosphate," none of the phosphoric acid is soluble, though certain crops, such as buckwheat and soy beans, can use it. In order to make the rock more soluble, chemistry has been applied, and we use what is known as acid phosphate or superphosphate. To obtain this phosphoric acid or superphosphate, rock or bone is mixed with an equal weight of strong sulphuric acid (H_2SO_4) and allowed to stand for a number of days, or until chemical action stops. There are present 2 acids and only 1 base. The stronger acid, the sulphuric, combines with most of the lime, making $CaSO_4$, or gypsum, which is insoluble; but the phosphoric acid in combination with 1 part of lime is entirely soluble and can be used by the crops. There is a small amount of the phosphate left, in which 2 parts of lime remain. This is called "dicalcium," or "reverted phosphate"; it is not soluble in water, but it can be dissolved by the root juices. We have, then, three forms of phosphate, containing respectively 3, 2, and 1 parts of lime to each part of phosphoric acid. These have been represented thus:

1	Lime Lime Lime	+Phosphoric acid		= Insoluble or tricalcium phosphate.
2	Lime Lime Water	+Phosphoric acid	+ One part of lime sulphate or gypsum.	= Dicalcium or reverted phosphoric acid.
3	Lime Water Water	+Phosphoric acid	+ Two parts of lime sulphate or gypsum	= Acid phosphate or superphosphate (water soluble).

The last two together are classed as available phosphoric acid. The advantages of the different forms are easy to understand.

Rock phosphate has twice as much phosphorus as acid phosphate, and costs only half as much per ton, making the real element phosphorus cost only one fourth as much. Acid phosphate, on the other hand, has nearly all of the phosphorus available and most soils of eastern United States gives much quicker returns when it is used.

The sulphate of lime, or gypsum, in acid phosphate is not injurious, and may serve a useful purpose in stable manure by changing to sulphate of ammonia and limestone, thus saving the expensive and volatile nitrogen.

Soil which is deficient in lime is nearly always poor in available phosphoric acid, as in such a soil the phosphorus is in chemical combination with the iron or aluminum of the soil. These phosphates are less useful than calcium phosphates. A test of the soil showing acidity always points to the use of soluble acid phosphate for "first aid," and a larger application of lime, rock phosphate, and organic matter for its permanent upbuilding.

Phosphorus is also secured from dried fish and animal tankage, both of which have about 5 per cent of phosphoric acid with 7 to 10 per cent of nitrogen. Basic slag is made of the finely ground linings of the steel converters in which the lime has attracted the phosphorus away from the iron. Basic slag is quite variable, but the phosphoric acid seems almost, or quite, as available as that in acid phosphate; in addition, slag contains a large amount of lime, usually 50 per cent.

The solubility of the soil phosphates is greatly increased by the presence in the soil of plenty of decaying vegetable matter, the effect probably being due to the bacteria of decay which act on the phosphates and cause them to combine chemically with the humus.

It has been recently proved that when sulphur is mixed with the soil, the bacteria cause it to change to oxide of sulphur and, finally, to sulphuric acid. As this is the acid which makes phosphate rock soluble, the experiment has been made of putting both rock phosphate and sulphur in a compost heap, with the result that the soil became much richer in available phosphorus, as shown by both chemical tests and crop records. This method is expected to prove of most value to truck growers who can make compost heaps.

In one important respect, phosphorus differs from potash. There is no large reserve of it in ordinary soils, to be set free by lime or by other treatment. Most of the soils of the United States contain so little that 100 full crops would seriously deplete the supply, while many soils have not enough phosphorus to give 25 crops without cutting down the reserve lower than Nature will allow. It is, therefore, a problem of how to buy enough for maximum crops and keep it in available form for plants to use. Much of the most valuable phosphorus in the soil is in an intricate chemical combination with the organic matter or humus, thus making three factors in maintaining an available supply: (1) we must add it to practically all soils; (2) lime must be present to keep from combining with the iron or aluminum; (3) organic matter is needed, to hold it in available form, and by its decay change it from insoluble tricalcium to soluble forms.

Potash. Potash is needed by all plants; and as the supply in the soil is tied up in very complex and insoluble silicates, we often need to apply a soluble form, in order to give our plants enough for a full crop. The value of a fertilizer depends not only upon what plant food it brings, but upon what else it leaves in the soil after the plant food is gone. If we could employ nitrate of potash, KNO_3, it would all be used, leaving no residue; but cost forbids, so we use muriate of potash, KCl, or sulphate of potash, K_2SO_4, each of which contains about half potash. If we use the sulphate of potash, K_2SO_4, there is left the SO_4, as in sulphate of ammonia, which will use up some of the lime and be insoluble. If we use the muriate of potash, KCl, the chlorine will remain, to combine with the lime and form a highly soluble substance, calcium chloride, $Ca(Cl)_2$, which will disappear in the drainage water. In either case, the use of potash reduces the supply of lime, or, if there is no lime, increases the acidity of the soil to the point of ultimate unproductiveness. As has been observed, calcium and potassium are quite similar chemically, and one may be substituted for the other, like Damon and Pythias in the old story. Our soil contains potash in the unusable form of a silicate of potash. Where lime is added to the soil, a certain amount may replace the potash, forming a silicate of lime and free potash.

Commercial fertilizers. In no way does the farmer make more use of his knowledge of chemistry than in the purchase and use of commercial fertilizer. The man who feels sure he knows no chemistry is at the mercy of the manufacturer or dealer whose interest it is to sell him the least possible plant food for the largest possible price. Examples of the gullibility of farmers are found in the names of brands, as "Queen of the Harvest," "Wheat King," etc. It is the custom to use finely ground coal cinders as filler, because farmers think a black fertilizer is rich; and the repetitions on the tag give the buyer the idea that there are in it a dozen, instead of three, fertilizing ingredients.

The question is simply one of buying the most pounds of phosphorus, nitrogen, and potash for a dollar, basing the proportions of the three on the amount and solubility of the stores already in the soil, rather than on the needs of the crop.

We laugh at the simplicity of the man who patronizes a particular physician because he gives so much dark-colored bitter medicine, and yet feel complacent because we have dosed our soil with 200 or 400 or 600 pounds to the acre of a fertilizer which the seller asserted loudly to be the "best on earth." Fortunately the law now requires all fertilizers to be clearly tagged, so that the buyer who wishes to can know what he buys. As the composition of these materials has been thoroughly discussed, it only remains to study the practice of buying and estimating values.

In practice there are just two problems to be faced: (1) What is a fertilizer of given analysis worth? (2) What can I mix, to get the composition I want?

Failure to answer these questions costs the farmers of the United States millions of dollars each year. When reading the tag, look for just three items: first, nitrogen; second, available phosphoric acid; and, third, soluble potash. Multiply each one by 2,000 and then by the value per pound given in your state experiment station bulletin for the current year, which can always be obtained free of charge.

It is often found that the amount of nitrogen is given in terms of ammonia, to make it sound better. If this is done, we should recall that ammonia is NH_3; then, by looking back at the table of elements, we find that an atom of nitrogen weighs 14 and each hydrogen atom weighs 1. Now, by giving them their weights, we find $14+3=17$, of which 14 parts, or fourteen seventeenths, are nitrogen. If the substance has 5 per cent of ammonia, we say 5 per cent of a ton is 100 pounds, and $^{14}/_{17}\times 100$ equals very nearly 83 pounds of nitrogen to the ton.

If we get prices on tankage, we find, in some cases, that the phosphorus is given in terms of bone phosphate of lime, in which form it actually does occur. Now this substance is the same as in rock phosphate, $Ca_3(PO_4)_2$, or tricalcium phosphate. We have our other phosphorus fertilizers in terms of phosphoric acid, so let us put the chemical weights in the place of the chemical symbols:

$$Ca_3(PO_4)_2.$$
$$120+62+128=310$$

The weight of P_2O_5 is $62+80$, or 142. Therefore we may say that one hundred and forty-two three-hundred-and-tenths or about 46 per cent of the bone phosphate of lime is phosphoric acid. One of the most-used fertilizers is called a 2–8–2, as it contains 2 per cent of nitrogen, 8 per cent of phosphoric acid, and 2 per cent of potash. Such a mixture can be made of 1,300 pounds of good materials, leaving 700 pounds to be made up of worthless filler, as cinders or other material. This filler requires bags, costs freight, haulage, and distribution, and is used simply to give a cheap purchaser a lot for his money.

If several grades are offered, you will be surprised to find that fertilizers of the highest grade usually supply the most plant food for a dollar. Those fertilizers containing 4 per cent of nitrogen or more are high-grade, and those containing less than 3 per cent are low-grade. The nitrogen of fertilizers containing 4 per cent or more is certain to be of high availability, in the form of dried blood, nitrate of soda, tankage, or fish; while fertilizers with 1 or 2 per cent of nitrogen may supply it as dried garbage, swamp muck, or some other less valuable forms.

Let us assume you decide to use a fertilizer containing: nitrogen 4 per cent, or 80 pounds in a ton; available phosphoric acid 10 per cent, or 200 pounds in a ton; potash 3 per cent, or 60 pounds in a ton.

On a staple, full-season crop, such as potatoes, it would first be necessary to consider the sources. Two sources of nitrogen should be taken, one available early in the season, the other more slowly. These are found in nitrate of soda and high-grade tankage. Four per cent of a ton is 80 pounds, of which half is to come of nitrate of soda with 16 per cent nitrogen; 40 pounds divided by 16 per cent gives 250 pounds as the proper amount of nitrate of soda. The other 40 pounds is to come from tankage containing 8 per cent nitrogen, or 500 pounds. The tankage contains 5 per cent of phosphoric acid, or 25 pounds in all, reducing the total to be secured from 16 per cent acid phosphate to 175 pounds. One hundred and seventy-five pounds divided by 16 per cent gives a little over 1,000 pounds as the quantity necessary to supply the phosphoric acid. The 60 pounds of potash will come from the sulphate containing 50 per cent actual K_2O or, since the material we buy is

half potash, we get twice as much, or 120 pounds.

We now have all of the ingredients, namely: nitrate of soda, 250 pounds; tankage, 500 pounds; acid phosphate, 1,000 pounds; sulphate of potash, 120 pounds; total ingredients, 1,870 pounds.

Although this lacks 130 pounds of a ton, it has all that we aimed to get, and all from high-grade materials without filler, of which many low-grade fertilizers contain from 300 to 800 pounds. Home mixing of fertilizers saves money, and gives good results in crops; but it has never been widely popular. No company cares to sell "the makings" in small amounts, while many strive to sell complete fertilizers on which there are several more dollars a ton profit; but in some sections, as eastern Long Island, clubs of farmers choose a purchasing committee which decides what formula to use and of what materials it shall be made up. Bids are then solicited, the order placed, and the company mixes the materials to order.

As in the case mentioned above, fertilizers are often spoken of by formula, as a 2–8–2, meaning 2 per cent nitrogen, 8 per cent available phosphoric acid, and 2 per cent potash. In the absence of potash, a 5–10 fertilizer is often used on potatoes or truck, and a 3–12 on corn.

Unit system of buying. The wholesale trade quotes prices on what is called the "unit basis," which simply means at so much for each per cent in a ton, or 20 pounds. To make this plain: Phosphoric acid is worth $1.60 a unit, and nitrogen $5 a unit. Tankage has a composition of 8 per cent nitrogen and 6 per cent of phosphoric acid; the 8 units of nitrogen being worth $40, and the 5 units of phosphoric acid $9.60, or $49.60 a ton for that grade of tankage.

This method should be used by all farmers who are progressive enough to buy their materials together and mix just what their experience tells them their land needs.

The form in which the plant-food elements occur is as important as their composition. Nitrogen, as nitrate of soda, is not held by the topsoil, but penetrates deeply and is more fully recovered than in the form of sulphate of ammonia. Dried blood quickly decays because of bacterial action, forming, first, ammonia, which is held by the soil water; then the ammonia is changed to nitrites, and these, in turn, to nitrates which are useful to all plants. As this change is reasonably rapid and complete, a pound of nitrogen in blood is as valuable as in nitrate of soda. Tankage decays somewhat more slowly, seeming to give just about the distribution through the season needed by corn.

Bone with 4 per cent of nitrogen decays more slowly, making it very desirable for grass and shrubbery. Fish is slower than tankage, but generally satisfactory on full-season crops. Swamp muck, peat and garbage tankage are so slow that they should not be bought at the same price as higher grade forms of nitrogen such as blood.

There is on the market one other nitrogen compound which demands attention on account of its chemistry and, possibly, its large future production. Cyanamide is made from the free nitrogen of the air by electrical energy at Niagara Falls. Quicklime (CaO) and coke ($3C$) are first heated to make the familiar calcium carbide used to make acetylene (CaC_2), the gas CO passing off. The carbide is cooled, crushed, and again heated red-hot in the presence of nitrogen or air from which all oxygen has been removed. The reaction is $CaC_2+N_2=CaN, CN+C$, which serves as a valuable nitrogen fertilizer reacting with the soil water to form ammonia compounds available to plants. It is also of interest since it leaves a residue of lime in the soil instead of an acid.

The Chemistry of Plants

In the beautiful lines on the opposite page does the farmer, musician, and soldier-poet Sidney Lanier tell his appreciation of the wonderful chemistry of the corn plant as he saw it grow in the fields of Georgia.

Looked at in a less poetic way, we see in every plant a wonderful chemical laboratory where all the food in the world is made out of the products of decay. Not one bit of food exists in the world to-day except through the chemistry of the plant. We eat the product of a plant once or twice removed; we may eat the flesh of the animal, but this animal had to grow to maturity by feeding on plants.

Chemistry has made wonderful progress in the last century; but the green leaf of the plant still holds the secret of taking the carbon dioxide gas from the air, of causing it to combine with water to give us starch, sugar, or fiber, and of returning to the atmosphere the life-giving oxygen which we must have. If we take sugar or starch in a glass tube, and heat it over a flame, we

find that it gives off five ninths of its weight in water and leaves four ninths in solid black charcoal. After we have taken it apart and weighed the parts, should we want our sugar again, we would find that, as in the old rime, "All the King's horses and all the King's men, couldn't put Humpty Dumpty together again." The reason for this is that not only does the sugar contain carbon and water, but it has stored up in it a large amount of energy which it is the special province of green leaves to extract from the sun's heat.

Chlorophyll. When you have been walking across bare, dry ground or along a dusty road and have occasion to enter the woods or even a tall cornfield, you are grateful for the coolness. It does not often occur to you, though, to ask yourself what has become of the heat which fell on the wood or the cornfield. If, on the other hand, you walk on a railroad track, you may be almost overcome by heat, and will believe the common saying, that the rails "draw the heat." The truth of it is, however, that rails do not draw heat, they only absorb it; and, when they are hot, they reflect it again. The green leaf draws just as much heat as does the steel rail or a bright tin roof; but it never gets hot, because it has the power of using the heat to put energy into the plant substance. Here it lies latent until the digestion of an animal, or decay, or fire, sets it free again as heat or motion. While we do not know how the plant is able to store up the hot summer sunshine, we do know that the special machine with which it is done is in the green coloring matter of the leaves, which we call "chlorophyll." If we take a green leaf and dip it in boiling water to kill the cells and then dip it in alcohol, we can wash out this wonderful substance and examine it. The microscope shows it to be composed of definitely shaped particles, vivid green in color, but nothing else. The analysis of the chemist shows it to be much like the rest of the plant, containing nitrogen, carbon, water, and more iron than any other part of the plant; but, examine and analyze as we will, its secret is beyond us.

CORN

Thou hast built up thy hardihood
With universal food,
Drawn in select proportion fair
From honest mould and vagabond air;
From darkness of the dreadful night,
And joyful light;
From antique ashes, whose departed flame
In thee has finer life and longer fame; . . .
From potsherds and dry bones
And ruin-stones.
Into thy vigorous substance thou hast wrought
Whate'er the hand of Circumstance hath brought;
Yea, into cool solacing green hast spun
White radiance hot from out the sun.
—SIDNEY LANIER.

Plants like dodder or love vine, which suck the juices of other plants, have no chlorophyll, as they do not need to create what they can so easily steal. On the underside of the leaf there is generally less chlorophyll than on the top; and a careful examination reveals a great many stomata, or tiny openings, by which the air is able to enter the leaf. Mixed with the air is a small amount of carbon dioxide, given off by animals in their exhaled breath, by decay, by fires, and in gases given off by limekilns, and by volcanoes. As the molecules of this gas, which the chemist calls CO_2, come into contact with the leaf cells, they combine with the molecules of water brought up from the soil by the roots to form starch and free oxygen. This change cannot go on unless there is present enough nitrogen to build chlorophyll, as well as an abundance of certain minerals which do not seem to take part in the change, but which by their presence cause it to take place. Phosphorus, sulphur, potash, lime are all needed in this important change, although only in small amounts. As

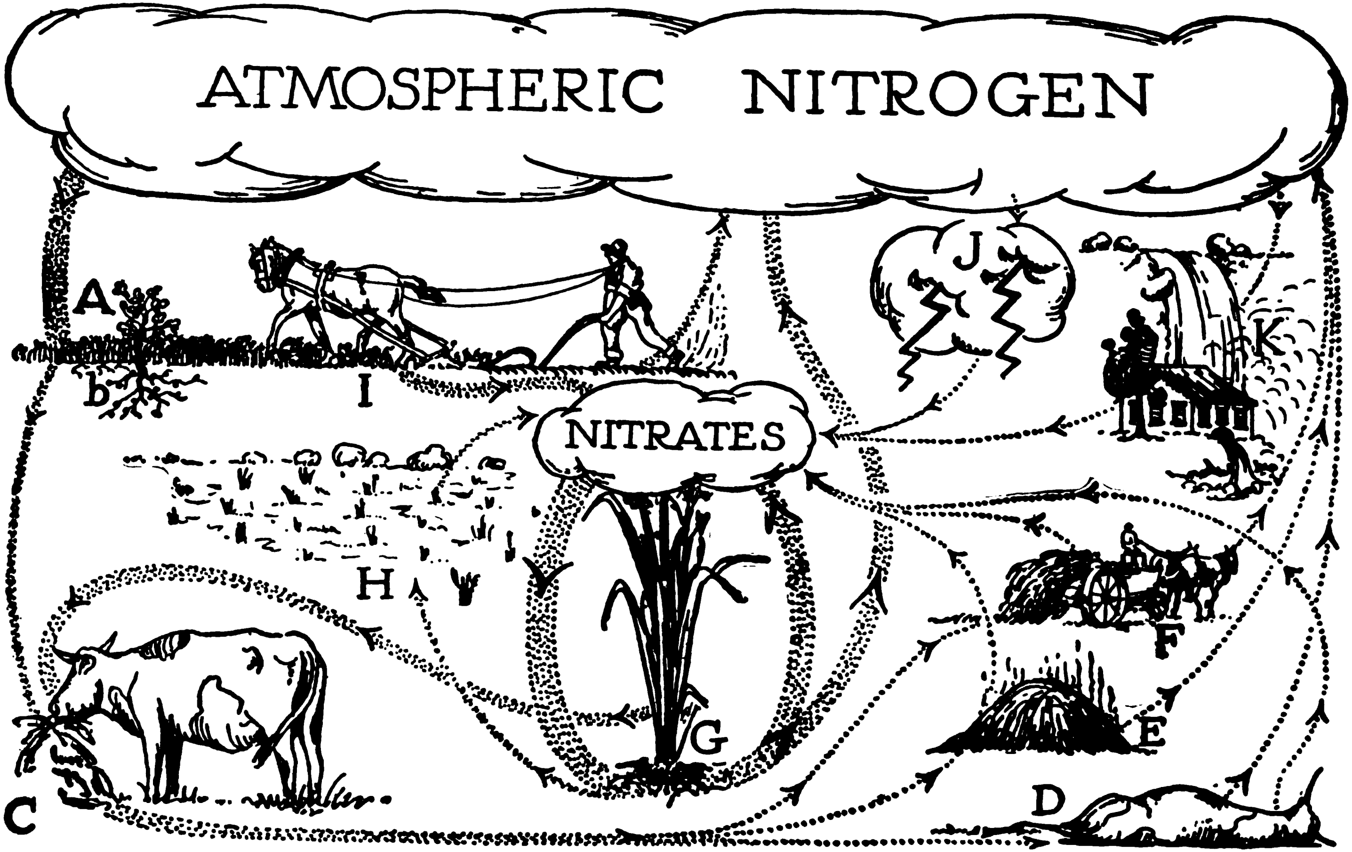


FIG. 326. Pictorial translation of Fig. 327. Note the courses nitrogen may take: through the root nodules (b) of legumes (A) and into the bodies of animals (C); through their decay (D) into the soil (where it is changed to nitrates) or back into the air; through manure piles (E) and freshly spread manure (F) both of which deliver some to the soil and lose some into the air; through the plowed-under cover crop (I); through the action of thunderstorms (J) and the efforts of man in making nitrogen fertilizers (K, see p. 374), both of which methods change the atmospheric form directly into nitrates. Note also how plants (G) taking the nitrates, may either decay and give the nitrogen back to the air and to soil bacteria, or may be eaten as fodder (C) and start the cycle anew; or, as stubble plowed under (H), may again deliver their nitrogen to be remade into nitrates and started on another journey of service. The farmer's task is to promote all those changes which hold the nitrogen in the soil, and to check those which result in the loss of nitrogen into the air.

long as the sun shines, the busy work of making starch goes on, as we can see by the presence of great numbers of starch grains in the leaf. When night comes and there is no more sunlight to use in making starch, the busy chemical laboratory of the leaf proceeds to dispose of its product.

Starch. Starch is a solid and can no more travel through the veins of the plant than a brick can go through a water pipe. The minerals potash, phosphorus, sulphur, and lime are again used; and the molecule of starch, which consists of 6 atoms of carbon to each 5 molecules of water, has 1 more part of water added which completely dissolves it and changes it to sugar. This sugar can freely traverse the veins of the plant to the spot where growth is taking place; and here it may again be changed to starch, if in a seed or a potato tuber, or to fiber, if in cotton. Sugar, starch, and plant fiber, or cellulose differ from each other but slightly in the proportion of water to the carbon. When the plant desires to form oil, as it does in corn and in the peanut, it does so by releasing a still larger part of the oxygen and thereby increasing the proportion of carbon and hydrogen. In fact, we may think of fats or oils as being concentrated starch. The transference of starch requires larger amounts of potash, lime, phosphorus, and magnesia than does its formation in the leaf; and, if any one of these minerals is deficient, the starch is left congested in the leaf and stems. When potatoes are raised in poor, sandy soil and fed generously on nitrogen, they make a rank growth of tops, but develop few tubers, because the plant is unable to move the starch away from the leaves. This is caused by the leaves being congested with starch, in which condition they are more easily attacked by blights and rots. This fact has an important bearing on potato growing, where such conditions are often met.

Not all the plant products are starch, sugar, or fiber; the gluten of wheat and the proteids of alfalfa being examples. These contain, in addition to the carbon, hydrogen, and oxygen of starch, about one sixth of their weight of nitrogen and small but definite amounts of sulphur and phosphorus. The manner in which these proteids are manufactured out of the sugar and the nitrates is just as mysterious as the formation of the nitrates themselves, which has been described above under "The Chemistry of the Soil." Many of these nitrogenous compounds are exceedingly complex and contain a great number of atoms. Among them may be mentioned such drugs as cocaine, morphine, caffeine, and many others.

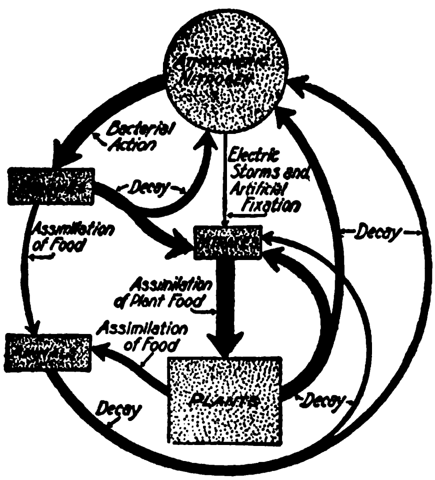


FIG. 327. The nitrogen cycle, showing how Nature transfers the element from its original source to the plant, and back again. Compare Fig. 326. (From "Foundations of Chemistry." Copyright, 1914, by A. A. Blanchard and Frank B. Wade. American Book Company, Publishers.)

How roots take in plant food. Mention has been made of the use to the plants of the minerals sulphur, potash, lime, and phosphorus taken from the soil. However, unless one has studied the subject, it is always a surprise to know what a weak solution is sufficient for the growth of the plants. Roots cannot bite off pieces of plant food as an earthworm swallows soil, but must have their food completely dissolved, so that it can be absorbed through the thin skin of the root. If you take a dried, withered prune and put

it in water, it absorbs the liquid, becomes plump, and, after a time, will burst like a frozen egg. The reason for this is that there is a strong solution of sugar inside and clear water outside, which causes the water to pass through the membrane toward the denser solution. This is what happens in the root and the soil water or "soil soup," as the solution of minerals has been called. The soil soup is absorbed until the root sap is as dilute, or thin, as the solution outside. Before this can be quite accomplished, some of the water has been used and some of the minerals taken out, making the solution in the root different again and stronger than the soil water and bringing a steady stream in to the plant.

Each pound of dry substance requires from 200 to 500 pounds of water to be passed through the plant. This water comes in as a dilute solution of soil soup, leaves its minerals to work in the plant, and passes out as a vapor. This process is called "transpiration." The quantity of water thus used or transpired by a good field of corn is enormous; a good hill uses from 3 to 5 barrels during its period of growth, according to the dryness of the air. If all of the water to grow a full crop were on top of the soil at once, it would be from 15 to 20 inches deep. Much of this water is of small use to the plant, which seems, however, unable to use a strong solution. If enough soluble fertilizer is put in the soil to make the solution stronger than that in the roots, the juices are drawn out of the roots and the plant wilts. This sometimes happens when a heavy application of fertilizer is used in a dry year.

The Effects of the Elements on Plants

Although all the elements taken from the soil are equally necessary to the growth of the plant, each one seems to have fairly distinct functions.

Iron is present in small amounts only; but without it the plant is pale, and cannot make chlorophyll.

Phosphorus. Phosphorus, besides making a part of the proteins and transferring the starch, is found in greatest amounts in the seeds. Unless an abundance of phosphorus is present, the plant may be unable to set perfect seeds. When wheat lacks plumpness, and is not up to the legal weight per bushel, it is often due to lack of phosphorus. The other cause is a disease or insect which injures the plant. If corn has a well-balanced ration of fertilizers, it gives a pound of dried grain for each pound of dry stalks; but, if it has difficulty in getting phosphorus and has plenty of nitrogen, it may give 2 or 3 pounds of stalks for each pound of grain. Phosphorus also hastens maturity and is used for this reason on cotton in the northern part of the cotton belt.

Potassium. Potassium is necessary early in the life of a plant and often decreases in amount as the plant matures. It is not stored in the seed to any great extent, but seems to be put away in the lower stalks, just as we put unused articles in the attic. A ripe field of corn has 9 times as much phosphorus in the grain as in the stalk and 3 times as much potash in the stalks as in the grain. For this reason, all grain-selling sections in time exhaust their phosphorus, but seldom their potash.

Lime. Lime is essential to growth in plants, but does not accumulate in the seeds. Plants which lack lime are usually lacking in hardiness and readily fall a prey to disease. Plants differ widely in their lime requirements. Some, like clover or peas, use three times as much lime as phosphorus, while others, such as corn, use more phosphorus than lime. Lime greatly influences the composition of leguminous plants by aiding the bacteria to secure nitrogen. Recent investigations have shown that the use of lime on soy beans increased not only the yield, but also the richness of the crop. My own observation is that limed soy beans have at least twice the feeding value per acre of an unlimed crop.

Nitrogen. The importance of nitrogen has been discussed, but its effect on the plant is not readily foreseen. When abundant in the soil, it promotes an undue growth of the leafy parts, making large thick leaves of a dark green color. Maturity is always delayed beyond the usual time; and if too much is supplied, the amount of seed may be reduced. An excess of nitrogen in fruit trees makes too much wood growth and delays the ripening of the wood, so that winter injury may result. It also tends to make large, poor-colored, acid fruit, and increases the tendency to fungous disease. Wheat is a crop that seems to lack ability to secure its own nitrogen, and for that reason it gets most of the purchased nitrogen on a general farm. As rapid, succulent growth is desired in many garden crops, a great deal more nitrogen may be profitably used in the garden than elsewhere. The amounts of some of the foods used by plants, as determined by chemists, are shown in the table at the top of the opposite page.

PLANT FOOD REMOVED BY CROPS IN POUNDS PER ACRE

Crops and Yields	Gross weight	Nitrogen	Phosphoric acid	Potash	Lime	Silica	Total ash
Wheat, 20 bushels	1,200	25	12.5	7	1	1	25
Straw	2,000	10	7.5	28	7	115	185
Total		35	20	35	8	116	210
Barley, 40 bushels	1,920	28	15	8	1	12	40
Straw	3,000	12	5	30	8	60	176
Total		40	20	38	9	72	216
Oats, 50 bushels	1,600	35	12	10	1.5	15	55
Straw	3,000	15	6	35	9.5	60	150
Total		50	18	45	11	75	205
Corn, 65 bushels	2,200	40	18	15	1	1	40
Stalks	3,000	35	2	45	11	89	160
Total		75	20	60	12	90	200
Peas, 30 bushels	1,800		18	22	4	1	64
Straw	3,500		7	38	71	9	176
Total			25	60	75	10	240
Mangels, 10 tons	20,000	75	35	150	30	10	350
Meadow hay, 1 ton	2,000	30	20	45	12	50	175
Clover hay, 2 tons	4,000		28	66	75	15	250
Potatoes, 150 bushels	9,000	40	20	75	25	4	125
Flax, 15 bushels	900	39	15	8	3	0.5	34
Straw	1,800	15	3	19	13	3	53
Total		54	18	27	16	3.5	87

Plants injured by gases. If an animal likes a certain place, it can stay there and avoid an unpleasant, unhealthful, dangerous neighborhood; but the plant is not able to move, and is more easily influenced by a bad chemical condition in the air or soil. The leaf has to be of a very open texture to admit enough air to supply the carbon needed. It is, therefore, readily injured by noxious gases. Smoke is apt to clog the pores of the leaf, and even dust from a highway will affect the plant on which it accumulates. It is a great advantage for a plant to be able to shake itself free of dust, and to this end the dashing rains of summer do more than water the roots. Gases often poison the leaf, as everyone knows who has tried to keep house plants in a room where artificial gas is burned. I have seen a large modern greenhouse made useless for two years because gas from a leak in the main across the street came under the frozen ground all winter. Although the odor was never perceptible to the workmen, none of the plants bloomed, and sensitive ones died outright. In Butte, Montana, the copper smelters give off enough sulphurous acid to kill vegetation about the works. Roses seldom thrive as well in the great manufacturing cities as they do in the open country, where they are free from the poisonous chemical compounds of the smoke-laden city air.

If plants are sensitive to chemicals in the air, which changes constantly, they are doubly sensitive to chemicals in the soil, which is in contact with their roots. We often employ soluble forms of arsenic to exterminate grass and weeds from our walks, roads, and tennis courts. A mixture of 1 pound of white arsenic boiled with 2 pounds of washing soda and diluted to make 7 gallons, is as violent a poison to plants as it is to animals. The arsenic used for spraying fruit trees does no harm because it is insoluble. Strong acids make the soil permanently sterile. I saw a spot on a farm in northern Virginia where no plant had grown since the Civil War, at which time a wagon broke down there, spilling the sulphuric acid (H_2SO_4) used in filling an observation balloon. All the rains of 50 years had been unable to wash this acid out of the soil.

Small amounts of acid food for certain plants. Small amounts of acids in the soil may not kill plants; indeed, they may actually favor the growth of what we call "acid-loving plants." If we see huckleberry, sweet fern, wintergreen, and laurel growing in the woods, we know that the land is sour. If our fields produce daisies, goldenrod, running blackberries, and sorel, we know that the soil lacks lime or is sour. We know, as practical agriculturists, that alfalfa will tolerate no acid, red clover very little, alsike more, and cowpeas a great deal. Soy beans need more lime than cowpeas, and timothy more than redtop. Cantaloupes thrive with lime, but

watermelons do not. Beets, spinach, and lettuce are more sensitive to lime than are other garden vegetables. The amount of the element calcium in a plant is not a measure of the need of that plant for lime. Certain plants, such as beets, must have the soil in a definite condition in order to grow, though they do not use any more lime than other plants which grow with less.

An acre of potatoes uses more lime than an acre of wheat; but we seldom put lime directly on potatoes, because a small amount of free acid does not check their growth. On the other hand, a little acid seems to improve the quality and keeps them free of scab, the fungus of which does not thrive in an acid soil. This brings the potato grower face to face with a most difficult chemical problem; for if by keeping his field acid, in order to raise his crop free from potato scab, he brings the lime supply too low, he is unable to raise any leguminous crops, but must buy all of his nitrogen, which is very expensive. The solution of the problem is to apply moderate amounts of lime and then plow large crops of green manure into the soil, with which the lime will combine as humate of lime and be available to the potato as a plant food without entirely neutralizing the soil. If no lime is used, the yield is reduced; and, if the potato grower fails to keep up the soil acidity with vegetable acids, the quality of his potatoes will deteriorate.

If the condition of the soil is solved in this way, certain legumes such as cowpeas will thrive, or, if the territory is too far north for them, alsike clover, and winter vetch will supply the needed nitrogen, and reduce the cost of production.

A large grower of cabbage told me that if he used potash as a fertilizer on his beds of seedlings, it caused them to turn yellow and remain undersized. This was peculiar, in as much as cabbage uses considerable potash. When I investigated, I found the cause a simple chemical one and easy of solution. The soil was already as sour as cabbage could stand and thrive. The potash was applied as a muriate of potash (KCl), of which the potassium was used or fixed by the soil, leaving the chlorine to become free hydrochloric acid (HCl) which made the soil too sour for a young cabbage to grow in. The solution of the problem was to add the necessary potash either in the form of barnyard manure or else in the form of carbonate of potash (K_2CO_3) which does not increase the acidity of the soil. The successful tobacco grower often burns brush over his seedbeds because the ashes contain potash as a carbonate, which decreases the acidity of his soil. More than a slight acidity of the soil is a brake on progress. It is a friction which must be steadily overcome before progress can be made.

Too much aluminum hurtful. A condition which is becoming common in regions of little lime is that of having too much of the element aluminum in the soil solution. Aluminum forms some 10 per cent of the earth's crust, but has no place in the plant. Plants do not thrive in the presence of soluble forms of it, such as alum, but differ in their susceptibility. Sour soils seem to dissolve the alumina which, however, is thrown out of solution by hydrated lime. This condition is becoming prevalent in many of the soils of eastern United States, where the soil has long been used for cultivated crops, and where the use of much potash has exhausted the lime.

Plants have considerable ability to choose their food from the soil, but their composition is, to some extent, due to their food. Rich food makes rich plants. The bluegrass of southwestern Virginia fattens steers to a point where they are ready for export, but on less-favored soils the grass is less nutritious. The addition of nitrogen to the soil improves, in many cases, the quality of the crops as much as it increases the quantity.

The Chemistry of Animals

The chemistry of animal life is as different from that of plants as the chemistry of plants is from that of the rocks. It is true that we cannot duplicate the processes of nature and create food in the chemical laboratory; but we can control these processes by spraying, fertilization, shade, irrigation, and tillage. We cannot either create life or duplicate some of its processes; but we can, by proper knowledge of the laws of chemistry, accelerate the desirable changes, and retard the undesirable ones. In comparison with a plant, we find that the animal is a user of energy, while the plant is an accumulator of energy. The plant builds up complex compounds, and the animal uses them for food, and eliminates them as simple products such as carbonic acid and water.

Animals simpler in composition than plants. Animals are simpler in their composition than plants in the sense of containing less chemical elements, but

the compounds they form are more complex. Like plants, animals are composed mostly of carbon, hydrogen, oxygen, and nitrogen, with phosphorus, sulphur, and calcium all fulfilling important functions. Iron is found in the blood, and a small amount of chlorine, sodium, and potassium in the fluids of the body; but neither potash, magnesia, nor silica occurs in large amounts. From a chemical standpoint, the most important change going on in the body is that of oxidation, or the burning up of the sugar of the body, thus setting free energy and heat. There are two great uses for food in the body: first, the building up of body tissue such as blood, nerves, muscle, etc.; and, second, the supplying of fuel for heat and motion. By far the largest part of the food of a mature man or animal is used in the second way. It never becomes a part of the real body any more than the coal in the fire box is a part of the machinery of the engine. When food is taken into the stomach and digested, the changes are mostly those of solution, so that the foods in the stomach may be taken to the liver for distribution. Much of the food we eat is starch, which is not soluble, therefore it must be changed to a soluble compound. This is done by the same method which the plant employs after the starch has been formed in the leaf. There are in the saliva and other digestive juices, certain substances called enzymes, which have the power to change many hundred times their weight of starch to sugar without the enzyme itself being changed or used up. The change from starch to sugar is only a slight one, consisting of the addition of a molecule of water to the 5 molecules already in combination with the 6 atoms of carbon found in each molecule of either starch or sugar. The sugar in liver is called "glycogen," or animal sugar, and is ready to be used by the body the for fuel. This glycogen is always found in the blood of a normal animal, and seems to be taken up by the hungry cells just as the live cells of plant roots take their nourishment from the soil solution.

Muscle cells. The cells of the muscles also need oxygen. When we breathe into our lungs a mixture of molecules of oxygen and nitrogen, the nitrogen leaves the lungs in the same condition in which it entered; but the oxygen passes through the thin walls of the lungs, and is carried away by the tiny red corpuscles of the blood on the other side. It would not be amiss to think of the red corpuscles as boats which carry the cargoes of oxygen to the muscle cells, where they are used to produce energy. We do not know how the power is produced; but we do know that sugar goes into the muscle, oxygen is absorbed, and carbon dioxide is given off just in proportion to the amount of muscular energy produced. *The muscle cell is the original internal-combustion engine.* It is a surprise to many people to find that the muscle itself does not wear out perceptibly in work. When we feel tired, it is because the available glycogen is gone. Endurance is the ability to supply the fuel of the muscle as fast as it is used, and to give enough oxygen to provide the energy as fast as it is needed. Oxygen is, then, our most important food and the one about which we often care the least. When we feel chilly, it is possible to get warm by taking 25 deep breaths of pure air, which so increases the supply of oxygen in the blood and muscles that plenty of heat is produced. Heat is usually produced in the body as a sort of by-product of motion; but, if need arises, food can be burned for heat alone.

Animals, such as dairy cows, when fed full rations, can hardly be said to use a share of their food for heat, because the heat produced by eating, digestion, and secretion is enough. The largest butter records are generally made in the coldest weather when the cow is not made uncomfortable by the heat of her body. I have seen large records made when the stables were at a freezing temperature.

The changes in the nitrogenous, or proteid, foods are more complicated than those of the starches or sugar. We know that part of the food is used to repair the waste of cells and to keep up the supply of blood, and that another part is used to form the protein substances in milk, as casein or albumen; but we are sure that all that is used in the body will be broken down and thrown off from the body by the kidneys as urea and uric acid or some similar product. The urine of an animal contains all of the nitrogen that has been used by the body, or some 60 per cent of the total. The remaining 40 per cent, in the solid excrement, is not so valuable for fertilizer because it is less soluble. While many of the intermediate steps are unknown, we can come to this certain conclusion: The starch and sugar are eliminated from the body through the lungs as carbon dioxide and water, while the protein is broken down into urea and escapes by way of the kidneys.

Why milk production decreases. The mineral portion of the food is now attracting much attention. Just as carbon or hydrogen cannot be substituted for protein containing nitrogen, we know that nothing can take the place of iron or phosphorus or lime. Corn is an example of a grain with so little lime that young animals fed on it exclusively do not have strong bones. Alfalfa and wheat bran are well supplied with phosphates and lime. Recent studies have shown that cows which are big milkers give off more calcium and phosphorus than they can secure from their food. When the store in the body reaches a certain low point, nature puts the brakes on milk production, and, despite feed or care, the cow decreases her production until her outgo equals her income of these two substances which we have never before considered as important foods. Up to the present, no method has been devised to feed cows an excess of either of these elements. It seems probable that this is the explanation of cows doing badly after an exceptionally big year. Breeders know that a big milking cow often produces a small, weakling calf, the reason being that the cow has no reserve supply of the minerals so necessary in forming the tissues of the next generation.

What chemistry has done for the dairy cow. The knowledge of chemistry has done more for the dairy cow in 40 years than had unskilled effort in the preceding 200. The Babcock test, described elsewhere, showed us the composition of milk, and gave us a basis for the selection of the best animals for breeding. This test also gave us a basis on which to build, for the dairy cow, a ration suitable for the manufacturing of the digestible and concentrated dairy products so necessary to health and comfort. We know that we must give the cow as much of the element nitrogen as we expect to find in the casein of milk, in addition to what she must have to supply her own needs of life and reproduction. We know from chemistry that no other element can be substituted for nitrogen, which forms about one sixth of the food substance protein. Thus chemistry, in the hands of practical men, has given us the balanced ration for animals and man, as well as the complete fertilizer for plants.

In addition to the principal foods, such as starch, protein, sugar, fiber, and minerals, there seem to be certain substances, called "vitamines," which are necessary in animal nutrition. These widely scattered and often complex substances are more frequently needed by young animals than by those of greater maturity.

Pigs fed on corn alone, or with mineral phosphates and lime added, were unable to grow, though kept for several years. Adding a very small portion of dried skimmilk produced a steady growth, as did a number of other substances. This does not mean that corn is not a good feed for pigs, but that a mixed ration is necessary. Young rats (chosen for experiment because they mature quickly) were not able to grow at all unless fed on milk fat or fat from the yolk of egg. No other fat could replace this until the animal had passed a certain stage of development.

Other animals require peculiar food, as the laying hen, which must have a large amount of carbonate of lime, in order to make shells for the eggs. If this is not supplied, the hen develops an acute and abnormal appetite which leads her to eat her own eggs or to pull feathers from other fowls.

Disease due to improper food. A knowledge of the chemistry of farm animals has shown us that the so-called disease of "hollow horn" is really hollow stomach, or often a real protein starvation. This may be prevented and cured by the direct and simple method of feeding protein, starch, and fats in proper proportion and amount to supply the imperative needs of the animal's body.

Effect of lime and phosphorus. Certain regions of the world have long been celebrated for the domestic animals they produce and their strong and vigorous men and women. Among such we may recall the Vale of Cashmere, northwestern India, certain valleys in Arabia noted for fine horses, some of the counties of England, the islands of Jersey and Guernsey, remarkable for cattle; France, the home of the splendid Percheron horses, and the bluegrass region of Kentucky. In all of these places, separated in some cases by thousands of miles, under different governments, and with different market requirements, we find the one common fact that livestock seems to have a natural tendency to improve, while in other and less-known regions it shows a tendency to become poorer. This running-out tendency has long been recognized, and two thousand years ago the poet Virgil wrote:

Still will the seeds, tho' chosen with toilsome pains,
Degenerate, if man's industrious hand
Cull not each year the largest and the best.

When we investigate these favored regions, from which seem to come all of our improved races of livestock, we find that the cause of this improvement is chemical and that it is common to all the sections. The reason for this success is an abundance of both lime and phosphorus in the soil and plants in the one region and a deficiency of them in the other.

Effects of ignorance of chemistry. A good illustration of the effect of chemistry, or rather of the results of ignorance of it, came to the attention of the writer in 1915, when he was called on to visit and advise concerning an abandoned farm in southern New York, where there had been a great decrease in rural population and in production. In early days, soon after settlement, both hilltops and valleys were cultivated and gave good fields of all the staple farm crops, fruit, etc. Livestock flourished, and good farm practices were the rule. A reasonably dense population lived there in contentment and comfort. This soil was poor in lime, having become depleted by crops and by leaching away in the drainage water. As the lime decreased, the phosphorus was changed from phosphate of lime to unavailable phosphates of iron and aluminum.

As these changes occurred, the crops of clover, peas, and other legumes failed, and the hay produced was of inferior quality, while the grain was less in yield. As a result of the poorer quality hay and the reduced supply of grain feeds, the livestock ceased to grow well, and the making of dairy products, the chief source of income, declined. Less and poorer manure was made, and wheat was replaced by oats, and oats, in turn, by buckwheat. Less land was cultivated until there was not enough hay and grain to winter the cattle which could find summer pasture on the hill pastures. As these changes went on, fields and, finally, farms were abandoned, and the people found homes in new and richer soils, or, disgusted with the poverty of such declining agriculture, added their numbers to the increasing congestion of the city. Now the wild deer have paths over the tumbledown stone fences which once restrained the more profitable sheep and cattle. Now, too, the descendants of these people join in bread riots or write pathetic letters to the charitable associations, because their ancestors did not, and at the time could not, know that lime was lacking in their soil; that, with lime, phosphorus also was lacking, and that, with the aid of both, they could have grown legumes to furnish the nitrogen wherewith to make profitable crops and build up a permanent, successful agriculture.

Where there is plenty of forage of good quality, animals thrive and return a profit, and from the nitrogen-fed plants and animals comes a strong and permanent civilization. Neglect or willful ignorance of the knowledge which makes man the master of his environment results in just what we have had described above—a deserted countryside, with wild deer making new trails across the unused fields and obliterated roads, while crowded and helpless millions in the city cry vainly for the food that is not.

The Chemistry of Some Common Things

With such an elementary knowledge of chemistry as has been outlined above, it is an easy and agreeable task to inquire into the chemistry of some of the common processes and substances used or met with in our daily life. Not only will such a study enable us to understand better what we see, but it will enable us to predict and counteract what will happen when we do certain things.

The Testing of Milk

As nearly everyone is now familiar with the operation of the Babcock test for the fat in milk or cream, it is desirable to say a word or two as to its chemistry. The fat of milk rises as cream, because it is lighter than the milk. A quart of cream weighs less than a quart of milk; and the richer the cream, the lighter its weight. If cream all rose quickly and was of equal richness, no other test would be necessary than to observe the thickness of the layer of cream. Cream, however, does not rise quickly or completely, because it is only a very little lighter than the milk and because the milk is sticky and retards the motions of the particle of fat, as seaweed impedes a swimmer.

In order to overcome this, we add sulphuric acid to the milk and accomplish two things. First, we make the milk much heavier, so that the fat has more reason to float. This is just as eggs will float in brine, but not in water, because the brine is heavier. Second, the acid dissolves all of the milk except the fat, and removes the obstacle of stickiness. The lime in the milk forms a sulphate of lime, which is found in the bottom of the bottle, indicating something of the bone-making value of milk. The sugar gives up a part of its water to the acid, leaving some charcoal in the liquid, which darkens it. If both milk

and acid are warm, this happens to a great extent, and the test is obscured by the mass of charcoal in the neck of the bottle. Acids do not greatly affect fats, and for this reason the butter fat rises undisturbed to the graduated part of the neck, where it can be measured. The heat of the liquids in the test bottle is due to the violent chemical actions, and is no more unusual than the heat of slaking lime or fermenting manure. Acid of unusual strength burns the milk and makes particles of charred sugar appear in the fat column, while weak acid fails to dissolve the curd properly, and leaves white flakes to obscure the results.

Iron Rust

Nothing is more familiar to most people than iron rust, yet few understand it enough to control its effects. Common iron occurs in nature in combination with oxygen in the proportion of 2 atoms of iron to 3 of oxygen, or Fe_2O_3, which is familiar to us as iron ore, or rust, or Venetian-red paint. When this is mixed with carbon and heated, the carbon has the power to pull the oxygen away from the iron, allowing the iron to melt and run together. Thus the common metallic form is devoid of oxygen. Having thus been separated from oxygen, iron has a strong attraction, or chemical affinity, for it, which causes it always to tend to recombine with it or, as we say, to rust. Iron is seldom pure, but contains certain amounts of carbon, sulphur, or phosphorus, which seem to aid it in rusting. We often find in chemistry that the presence of some other element aids an action simply by being present; such an element we call a *catalytic* substance.

Pure iron and pure dry air do not combine at all, but impurities in the iron and moisture in the air seem to enable the air to get closely enough in contact with the iron to rust it. As soft wrought iron is the purest form, it lasts longest in exposed places, as fence wire or nails. Steel is not so durable, though its hardness and cheapness have made its use almost universal.

Causes and preventives of rust. The presence of salt in the rain or fog has a remarkable chemical effect in causing iron to rust. A mowing machine may rust more in a week's exposure to sèa fog on Long Island than in a season in Colorado. The question of durable fence wire is one of chemistry. I have on my own farm in central New York some of the original barbed-wire fence which has been in use 40 years without rusting, because it was made of a pure, soft wrought iron. Covering the iron with paint or a coat of zinc will keep both oxygen and water off, but, unless the iron beneath is pure, the rust will form wherever a break occurs in the covering. When iron rusts, it gains rapidly in weight; and 7 pounds of nails, when fully rusted, will weigh 10 pounds.

The rusting of iron is not confined to our implements and tools, but occurs also in the soil where much iron is found. As this occurs, the oxygen is absorbed, the rust increases in weight and bulk, splitting open the rocks and setting free plant food. Whèn the intelligent farmer finds streaks of iron rust in his subsoil, he knows that the rusting process is not complete, because there is not enough air. The lack of air will keep plants from sending their roots deeply for food and water. Iron rust is, therefore, a danger signal to the farmer, to be prevented in his implements by keeping oxygen away, and hastened in his soil by drainage and deep tillage. Iron combines with oxygen in two proportions, the combinations containing most oxygen being called "ferric compounds," and the others "ferrous compounds." Ferric compounds are generally red in color and insoluble, while the ferrous compounds are light in color and soluble. Soluble compounds of iron, as $FeSO_4$, are poisonous to plants, and are to be avoided, unless we want them to kill weeds. Thorough drainage aërates the soil and causes all of the iron to rust and so become insoluble and harmless.

Lime-sulphur Spray

A great deal of high-grade lime is used by progressive farmers in making the various lime-sulphur sprays which are now so largely used on fruit trees, but not on potatoes. Sulphur has a peculiar power over fungous diseases; but it is hard to use when dry, as it is easily blown off by the wind. Lime forms several compounds called "sulphids," containing different amounts of sulphur, and a sulphate which has already been discussed in its relation to manure (p. 371). Sulphur has several valences, or combining powers, which enable it to form a number of sulphids, as Ca_2S, CaS, CaS_2, etc., according to the temperature, length of cooking, etc. Self-boiled lime sulphur, made by the heat of the slaking lime, contains different compounds of calcium and sulphur than that which is boiled for several hours. As it is less soluble, it is used on sensitive trees, as the peach, while the boiled lime sulphur is used on apple trees. After the lime sulphur is applied, the lime combines with the air and water, forming a carbonate, while the sulphur is set free as an element in particles too small to see. Thus $2CaS + O_2 + 2CO_2$ becomes $2CaCO_3 + 2S$.

The sulphur in this extremely fine state seems to be the substance that controls scale and blight; but in order to secure the minute division, we must utilize our knowledge of the chemistry of lime and so accomplish the solution of the sulphur and leave to the air the task of restoring it to the necessary condition. The white, limelike whitewash, which appears a few days after a winter spray is applied, has another effect in that it reflects the light and heat which would be absorbed by

the dark twigs, and by delaying blossoming a few days, often enables the trees to escape a late frost. The purest grade of high-calcium lime, almost free of magnesium, is none too good for making the lime-sulphur spray.

Bordeaux mixture. Bordeaux mixture is another and, perhaps, even more important spray, since it is used for fruit, potatoes, and cucumbers, and is the only spray which controls several plant diseases. Copper sulphate, or blue vitriol, is the essential part of this spray, just as the sulphur is in the lime-sulphur spray, the rôle of the lime being to prevent the sulphuric acid doing more harm than the copper does good. When copper sulphate is dissolved in water, the molecule $CuSO_4$ seems to separate into two parts—copper and the sulphate radical SO_4. If you put a bright knife blade in the solution, you will find a plating of copper over it in a few minutes. The SO_4 part combines with the water to form sulphuric acid, as can be shown by the fact that it will soon cut a hole through a metal pail and will turn blue litmus paper red. Our purpose in making this spray is to leave the particles of copper free, but so to combine the sulphuric acid that it will be harmless. Several substances will do this, but lime is cheapest and best, the action being: $Ca(OH)_2 + H_2SO_4$ becomes $2H_2O +$ $CaSO_4$, which is insoluble and therefore harmless. When dilute solution of lime and bluestone are mixed, the particles of $CaSO_4$ are so small that they do not sink, but float, as dust does in still air. When concentrated solutions of lime and copper sulphate are mixed, curdling often results, and the large particles sink, making the last part of the spray quite different from the first.

We often hear that Bordeaux mixture must be freshly made. The reason for this is an obvious one to a person who has followed the foregoing explanation.

Not all of the copper sulphate molecules separate at first into copper and sulphuric acid. When a certain number have done so, the solution is as full as it can be of these divorced halves of molecules. After lime has taken some of the SO_4 out of the solution, other molecules separate, making the chemical change a continuous one for many hours. So it may (and frequently does) happen that a perfectly good Bordeaux mixture is left overnight and the following day finds that all of the available lime has been used and there is so much acid present that the plants are killed as by fire. On this account the lime and copper sulphate should be kept separate until wanted and then the part left should be dumped out at night.

There is a test for the condition of Bordeaux so certain that it should always be applied. Potassium ferrocyanide is a soluble yellow salt, often called "yellow prussiate of potash," which is almost colorless when poured into good neutral Bordeaux; but, if the lime has not combined with all of the SO_4, it makes a black, inklike streak.

A man who applies Bordeaux mixture without this simple, accurate test is as heedless as the man who leaves his barns uninsured. A half-ounce of the yellow crystals in a half-pint of water (which should be labeled "Poison") will make many tests.

A special Bordeaux mixture is used by many of the pickle growers of central Long Island, who put a pint of strong ammonia to a barrel of spray. The effect, which is good, seems to be due to the action of the ammonia in making the liquid spread out and wet the leaves completely, instead of drawing up into drops like dew on the grass or water on a dusty surface.

Insect poisons. Many of the insect poisons which are mixed with Bordeaux or lime sulphur are compounds which contain arsenic. Soluble compounds of arsenic are as deadly to plants as to animal life, but the insoluble compounds dissolve in the stomachs of insects. Arsenic, like phosphorus, forms acids, which combine with metals to form salts, most of which are insoluble. Paris green contains copper, but has lost favor by having some soluble arsenic, which may burn plants. Arsenates of lead, calcium, and zinc are all insoluble and safe to use. The free lime in the spray serves to keep the arsenic safe by combining with any soluble arsenic and making arsenate of lime, which is insoluble.

The Chemistry of Cider and Vinegar

In the section on "The Chemistry of Plants" it is explained how the plant makes starch and sugar out of water, carbon dioxide gas, and sunlight. The chemistry of fermentation begins with these products and ends where the making of the starch began. This branch of the science belongs to what is known as *biochemistry*, because it relates to the activity of microörganisms, as yeasts and bacteria.

A neighbor of mine who was arrested for selling hard cider made his plea to the judge that the cider contained no alcohol for, said he, "I made that cider myself and have always kept it locked up, and *I never put any alcohol in it.*"

Other equally ignorant, if more virtuous, friends have refused to eat pickles that were made with vinegar obtained from hard cider.

On and about apples are thousands of tiny yeast plants, some of which find their way into the cider, where they grow by breaking up the molecules of sugar and taking some energy from them. One molecule of sugar becomes 2 molecules of alcohol and 2 of carbon dioxide. The change is

$C_6H_{12}O_6$	=	$2C_2H_5OH$	+	$2CO_2$
sugar	becomes	alcohol	and	carbon dioxide gas.

The sparkle in fermenting cider is due to dissolved gases. When cider kept in a warm place stops frothing, it means that the sugar has become alcohol; the more sugar, the more alcohol in the hard cider up to a point where the alcohol kills the yeast.

If we shut this cider up in a jug or bottle it will remain indefinitely as cider, or apple wine; but, if we expose it freely to the air, another change takes place, and oxygen is absorbed, making the alcohol into acetic acid; then the whole is called vinegar. The more fully we expose it to the air, the more rapid the formation of vinegar. Just as hard cider has little of sugar, so the vinegar contains no alcohol. The chemical change is

$C_2H_5OH+O_2$	=	$C_2H_4O_2$	+	H_2O
alcohol *and* oxygen	*become*	acetic acid	*and*	water

The process is due to a bacterium which produces a slime called "mother of vinegar." When vinegar stands exposed to the air, it takes up 2 molecules of air and goes back to carbon dioxide and water, thus: $C_2H_4O_2+2O_2$ becomes $2CO_2+2H_2O$ and completes the cycle that began when a green leaf took up carbon dioxide and water to make sugar, thus: $6CO_2+6H_2O$ becomes $CaH_{12}O_6+6O_2$. A study of this entire reaction will be a most amazing proof that nothing in nature is ever wasted, but that all the pieces and parts are used over and over again.

Chemistry of Soaps and Sodas

Most people know that such a substance as sulphate of potash is made of a base (potash) and an acid (sulphuric), combined to make what we call a salt. But comparatively few people know that fats, also, are chemically salts, being composed of stearic or palmitic or other fatty acids and the base glycerin. When we make soap, we use a much stronger base than glycerin to replace it and form a new salt which we call a soap. Hard soaps are made with caustic soda, and soft soaps with caustic potash, the latter being the more soluble. Soap may be made with lime; but it is not soluble, and is only chemically, not practically, a soap. Hard water often contains lime, which curdles the soap, making an insoluble lime soap in the place of the soluble soda soap. Most soaps are boiled, after which salt is added, the object being to separate the soap from the water and glycerin; but some toilet soaps are made by a cold process which leaves in the glycerin. Floating soaps have air forced into them; while soft, rosin is sometimes added, to make a soap lather more freely and also to improve its cleansing power. Transparent soaps are made by dissolving the soap in alcohol which is later evaporated.

Soda is so much used that we seldom stop to consider what it is, what its effects are, or what residues it leaves in the body. Without going into the details of processes, it may be briefly stated that soda is made out of salt and limestone, the sodium coming from the salt and the "sizzle" from the lime carbonate.

Washing soda is simple sodium carbonate, or Na_2CO_3; but baking soda has a double portion of CO_2, and is given the composition $NaHCO_3$. If we put this in boiling water, 2 molecules unite, forming $Na_2CO_3+CO_2+H_2O$; but when an acid is added all of the carbon dioxide is given off, and the soda forms a salt of the acid. In cooking, the most common acid is sour milk, which contains a little less than 1 per cent of lactic acid, $HC_3H_5O_3$ (written that way because only 1 atom of it is replaceable by a base). The reaction is

$HNaCO_3$	+	$HC_3H_5O_3$	=	$NaC_3H_5O_3$	+	H_2O	+	CO_2
soda	*and*	lactic acid	*become*	sodium lactate	*and*	water	*and*	carbon dioxide

The sodium lactate is harmless; the other part of the milk adds food value; and the carbon dioxide makes the food "light." Bicarbonate of potash was the old-fashioned saleratus, and was displaced by the better and cheaper cooking soda. The object in the use of soda is to balance the soda and acid so evenly that none of either will remain in the food. Many other organic acids are used in the place of sour milk, such as the acids of molasses, of fruits, and of vegetables.

Baking powder. By far the most common method of separating the carbon dioxide from soda is by mixing it dry with a substance which will react with it when wet. Such a mixture is called "baking powder."

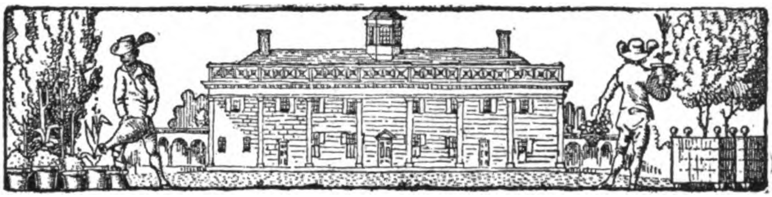
There are three types of baking powder, which, in the order of their value, are:

(1) *Cream-of-tartar powder*, a dry, acid salt.

(2) *Phosphate baking powder*, in which we use a good quality of acid phosphate, such as is used in fertilizer.

(3) *The alum powders.*

When the first is used, sodium potassium tartrate or Rochelle salts is left; this is harmless as taken in food, but a mild purgative in large amounts. The phosphates left when the second is used are neither helpful nor harmful. It is believed that the continued use of alum in any form is bad for the system. For further details about baking powders and their uses, see page 186.



CHAPTER 18

Other Sciences in Farming

ALTHOUGH farming, as we have said, is based to a greater or less degree on all the sciences recognized by man, it is sufficient for our purposes to discuss in detail only those with which the farmer is brought most closely in touch. In this group, in addition to physics and chemistry (already discussed) we include botany, breeding, geology and arithmetic, the first three representing divisions of the larger science of biology, and the last covering a field which is usually considered as of interest only to students, mechanics and scientific workers. How vital each of these is to successful farm practice is suggested in the following pages.—EDITOR.

BOTANY

By K. M. WIEGAND, *Professor of Botany, New York State College of Agriculture, who is a graduate of Cornell University, from which he also obtained his degree of Ph.D. For 12 years after graduation, he taught in the same institution; then for 7 years he was Assistant Professor of Botany at Wellesley College, whence he came to his present position which places him at the head of the Botany Department of the College. He has published many articles including several for the Cyclopedia of American Horticulture. His investigational and teaching work has been supplemented by botanical explorations in Newfoundland and other places nearer home.*

Botany is, indeed, one of the foundation stones of agriculture. It requires a man who knows the science thoroughly to explain its scope and purpose in such limited space. In Professor Wiegand, we have a man who can do this, and, what is more, in such a way that the explanation is made plain to every reader.—EDITOR.

WHAT botany is. Botany is the study of plants. It deals not only with those directly useful to man, but also with the great mass of wild plants making up the covering of the earth. This study of the vegetation of the earth is of direct importance to the farmer as it underlies the more modern and scientific point of view. To understand our crop plants, especially the newer introductions, we must be able to read about them accurately and intelligently. To understand the weed situation, and to identify the weeds, we must be able to use books designed for that purpose. In buying nursery stock of rarer fruits, and especially in purchasing ornamental shrubs, an ability to use catalogues is necessary; and the same is true in regard to the purchase of materials for the flower garden, the home, and the conservatory. Growers are finding it necessary constantly to write these catalogues in more scientific and technical language. An understanding of the classification and relationship of plants gives a better appreciation of the nature and qualities of related forms, and what to expect in their cultivation or eradication. An understanding of the various uses of the plant-parts to the plant, and the way in which the life processes are carried on, the source of plant foods, and the way in which these are taken into the plant is essential to the intelligent grower of

plants. The effect of limy and sour soils on crops is better understood, and may sometimes be predicted, if the relationships of the plant are known. The effect of wet and soggy soils, light and shade, competition with weed plants and other problems of this sort, become clearer if details have been looked into more closely, and the physiology is better known. Through the study of botany we come to know more accurately about the kinds of plants useful to man, and their products; where these plants are native; and the history of their use to man. The study of botany gives the farmer a broader and more intelligent background in his relation to plants. A knowledge of the kinds of plants and their relationships as well as the facts about them furnish a pleasure in themselves, and give a sympathy for things around one which is no small part of the enjoyment of life.

The study of plants may be divided into several rather distinct lines, as follows: the classification, identification, and naming of plants (Taxonomy); the parts of the plant (Morphology) and what they do (Physiology); the relation of plants to their surroundings (Ecology); the distribution of plants (Plant Geography), and the plants useful to man (Economic Botany). These may be considered in turn.

Classification, identification and naming. Plants are classified in order that they may be better understood. The number of plants in the world is almost beyond conception. Recent figures have placed this number as high as 140,000 for the higher plants alone, and there are probably 100,000 more among the mosses, mushrooms, seaweeds, and other lower forms, making fully 240,000 in all. Without some orderly method of arranging such a vast number of plants, there would be absolute confusion, for the mind cannot grasp so much detail unless it is carefully connected and coördinated. Classification is as necessary to the farmer as to the botanist, and should render his outlook on plants easier and better.

Like all human knowledge the classification in botany has gradually undergone change. Originally it consisted merely in arranging plants in groups according to similarity in a few features of structure or form, simply for convenience in thinking about so many forms. At that time it was thought that all plants were created as they are now. After the theory of descent came to be generally accepted, classifications were made over so as to show real relationship. Our modern systems are our best expression of what we so far know of the blood relationship within the plant kingdom. The old-fashioned classifications are called artificial systems, while the modern are termed natural systems.

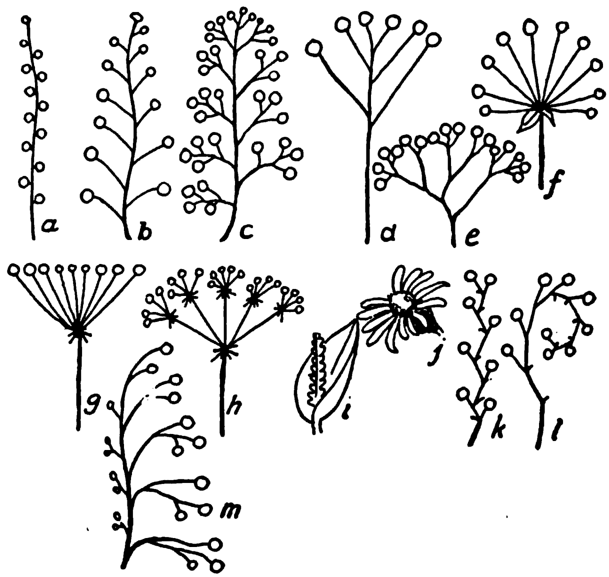


FIG. 328. Types of flower arrangement in diagrammatic form: *a* spike; *b* raceme; *c* compound raceme or panicle; *d* simple corymb; *e* compound corymb; *f* and *g* umbels; *h* compound umbel; *i* spadix; *j* head; *k* cyme; *l* scorpoid cyme; *m* secund cyme.

To use a key. Not only does classification help one to grasp and comprehend the great vegetable wealth of the land, but it enables us to identify plants which are unknown to us. For this purpose a skeletonlike outline of the classification is made, called a key, through which one may trace, step by step, the unknown plant until its place in the classification is finally reached, and its name obtained. It is important that the farmer be familiar with the use of such a key that he may be able to

use our text-books for the identification of weeds and other plants. The following is an example of such a key:

A. Plants grasslike; flowers green.
  B. Flowers in an open loose cluster...........Oat
  B². Flowers in a close dense spike likecluster Wheat
A². Plants not grasslike; flowers showy.
  B. Flowers borne separately, either solitary or in a loose cluster.
    C. Floral parts 3 or 6 in each set ....Lily
    C². Floral parts 5 or many in each set.
      D. Pistils many in each flower..Strawberry
      D². Pistils 1 in each flower...........Plum
  B². Flowers minute, borne in dense heads which themselves look like flowers....Sunflower

Suppose the user has in hand a lily but does not know its name. He begins by reading each of the two sections marked A, and makes a decision as to whether his plant belongs to the first A or the second A. It is found to belong in the second division. The next step is to decide whether it belongs to the first or second B group into which the A is divided. This is done by carefully reading the statements under B and B_2 and comparing each with the plant. It obviously belongs to the first of the B groups, which is not further divided but leads to the name Lily.

The second B group is still further divided into groups, and if the plant in hand had been a plum it would have been necessary to go farther in subdivision until, in the last D group, we are led to the plum. All keys are constructed on this principle, and their use is the same. There is some variation in the manner of indicating the successive group. Some authors prefer letters, others signs for indicating the small groups. Another somewhat different way of writing the above, much used in classifying animals, also mosses, ferns, and the lower plants, is as follows:

1 Plants grasslike; flowers green...................2
  Plants not grasslike; flowers showy................3
2 Flowers in an open loose cluster...............Oat
  Flowers in a close dense spikelike cluster...Wheat
3 Flowers borne separately, either solitary or in loose clusters.......................................4
  Flowers minute, borne in dense heads which themselves look like flowers ....Sunflower
4 Floral parts 3 or 6 in each set.................Lily
  Floral parts 5 or many in each set...............5
5 Pistils many in each flower.............Strawberry
  Pistils 1 in each flower.....................Plum

Success in the use of the key depends upon care and accuracy of judgment. Guesswork is a loser of time. It can be tolerated only when the particular feature of the plant mentioned in the key is not at hand, as for instance if the fruit is mentioned when we have only the flower. An attempt to obtain the fruit should then be made, but if this is impossible both sections of the key at this point should be tried in turn and the plant traced through each. A comparison of the two results will usually indicate which is right.

In the description of plants and in the keys mentioned above, one will find in most books a language in use which is not at once clear to the beginner. This is called the scientific language of botany.

Botanical language is an attempt to condense the descriptions and make them more accurate and definite. Frequently in ordinary language, because there is no exact word equivalent, a whole phrase would be necessary to express the idea that may be expressed by a single scientific word. By using these new terms each for an exact botanical idea, the description becomes more exact than would otherwise be possible. The botanical language at first seems very foreign and unnatural to the beginner, but it is really not difficult. A few terms looked up in the glossary (found in botanical books) from time to time will quickly enable one to read intelligently, and very soon this method of description will be preferred to the more cumbersome and inexact method otherwise necessary.

Plant names are of two sorts, the popular or so called common name and the scientific name. Common names are a part of the language of the people and their origin is in most cases lost in antiquity. Scientific names have been given by botanists and are constructed of Latin or Greek words. These names of the botanist seem very strange to the layman, and he is at first very loath to use them. The strangeness wears off, however, much sooner than one would expect. They are now being more and more generally used by laymen, and in trade, so that an understanding of them by the farmer is greatly to his advantage. In almost every seed and nursery catalogue of ornamental stock the botanical names and classification are used, and these are now frequently employed in bulletins and other reading matter for the farmer. This is not through a matter of choice primarily, but through necessity. Common names are very inexactly and loosely applied without any standardization. Frequently the same name has been applied to totally unrelated plants, as for instance in the case of the Snakeroot. This term has been applied to plants in the Buttercup, Milkwort, Birthwort, and several other families. The use of the word "snakeroot" therefore seems to indicate a relationship between these plants which does not exist, and is therefore very misleading. On the other hand, different names are often applied to the same plant, as in the case of the Shad bush. Along the coast, it is so called, but inland it is called June berry, and in the west Service berry. Common names are often very local, and not having been published with descriptions, it is impossible to make them definite, and often impossible to determine to what plant they belong. Many plants have no common name, as they were unknown to the general public. Frequent attempts have been made to construct a scientific nomenclature by definitely selecting or constructing a single English name for each plant. These have all proved impractical

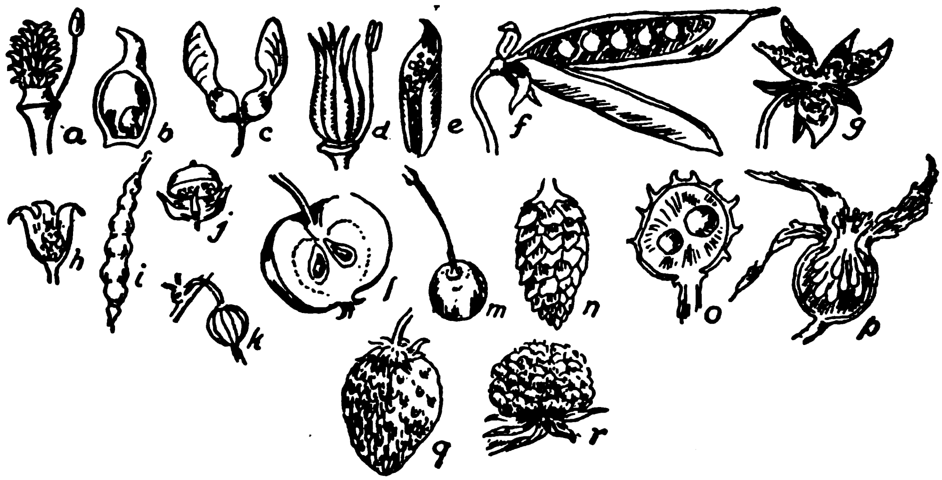


FIG. 329. Types of fruits: *a* achenes of butter cup; *b* single achene; *c* winged fruit (samara) of maple; *d* follicles of columbine; *e* single follicle; *f* pea pod; *g* violet capsule, half open; *h* section of another type of capsule; *i* pod or selique of mustard; j capsule or pyxis of four o'clock; *k* berry (gooseberry); *l* section of pome (apple); *m* drupe (cherry); *n* cone; *o* bur or husk containing two horse chestnuts; *p* hip (rose); *q* compound fruit (strawberry); *r* same (raspberry).

through the difficulty of distinguishing names thus constructed from those in general use. By employing a so-called dead language not now used by any people, this may be done. The Greek or Latin botanical name is, therefore, a necessity. After all, it is not difficult to become familiar with these names. They are no more foreign to our tongue than many which have recently come into general use. The words aeroplane, automobile, bicycle, and many others are just as much Latin as are the plant names, but we are now unconscious that they were derived from a foreign language.

The scientific name of every plant is composed of two words, as for instance, *Quercus alba*, the White oak. Of these the first is a noun, and answers to the surname among people. The second is an adjective indicating the particular kind, and corresponds to the given name. It is customary in Latin to write the adjective after the noun rather than before it as in English. Quercus signifies oak. and alba white, or white oak. *Quercus rubra* is red oak. *Quercus Michauxiana*, Michaux' oak, was named after an early botanical explorer in America, Andre Michaux. Botanical names are not used at random, but their use must follow definite rules or laws which constitute a *code of nomenclature*. The most important of these laws is that the very first name ever applied to the plant must be used, provided that it was properly published, and had not been used before for another plant. This is called the law of priority. It so happened that, in early times, when it was difficult to know what other men were doing, different botanists would give different names to the same plant. The earliest one only can be used; the others are called synonyms. In books we often find an abbreviation after the name. This indicates who gave that name to the plant; thus *Pinus Strobus L.* indicates that the great naturalist of the eighteenth century, Linnæus, first gave the name Pinus Strobus to the white pine.

Classification. Since the modern classification of plants is based upon relationship through descent, we begin our classification with the more primitive groups and progress toward the more recent. Usually the primitive are also more simple in structure, and the more recent are increasingly complex. This is, however, not always true, for sometimes history shows a degeneration in certain groups.

The largest groups into which the plant kingdom is divided are called *divisions*, such, for example, as the Algae, Fungi, and the higher or flowering plants. These are divided into *classes:* the classes into *orders*, the orders into *families*, and these in turn into *tribes*, then into *genera* and the genera into *species*. Oak is a *genus*, while white oak and red oak each constitute a *species*. Oaks, chestnuts, and beeches all belong to the same *family*. Ordinarily the species is the ultimate unit in classification, and represents a definite kind of plant. Each kind of plant is a species. Sometimes, however, in the case of species which are not always quite uniform in appearance, the species is divided into *varieties*, which represent well-marked strains of variation. The series of groups, therefore, in going from the broadest to the narrowest and smallest, is as follows: division, class, order, family, tribe, genus, species (variety). The classification of the plant kingdom into its larger groups is as follows:

DIVISION I Thallus plants undifferentiated into stem and leaf. (Thallophyta.)
Class 1 Bacteria
" 2 Slime molds
" 3 Algae
" 4 Fungi
" 5 Lichens

DIVISION II Mosses and Liverworts (Bryophyta)
" III Ferns and Fern Allies (Pteridophyta)
" IV Seed Plants (Spermatophyta)

SUB-DIVISION I Pines and other cone bearers; seeds not in an ovary (Gymnospermae)

SUB-DIVISION II Flowering plants; seeds in a closed ovary (Angiospermae)
Class 1 Plants with one seed leaf (Monocotyledones)
" 2 Plants with two seed leaves (Dicotyledones)

The **Bacteria** constitute a group of very simple plants related to both the algae and the fungi. They are by many considered to be degenerate algae which have lost their green color and become parasitic, or live on dead matter. Bacteria are the smallest known organisms, consisting of extremely minute individual cells, or chains or plates of such cells. Under certain conditions, they reproduce by spores after the manner of algae, though their actual increase in number is by division of the cells. Bacteria are not dissimilar in form and structure, but in their effect upon their surroundings, they differ very widely. It is because of this that these minute organisms are of the greatest importance to other plants and animals. Most disease is due to them, also most decay. If it were not for bacteria and fungi, together the greatest scavengers of the earth, the earth's surface would soon become clogged with plant and animal remains. Bacteria in the soil render it fit for plant growth for to them the available nitrogen is due, and they also cause other important changes in the soil necessary to plants. The number of species is 1400 or 1500.

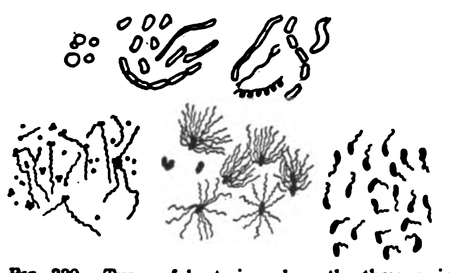


FIG. 330. Types of bacteria: *above*, the three main classes—round, rod-shaped and spiral; *below*, various forms equipped with *cilia* or hairlike projections which enable them to move.

The **Slime molds** (Myxomycetes) make up a group of low and very simple organisms of probably great antiquity, lying on the border line between plants and animals. Various kinds may be found in the woodlands in summer, where in the rainy season they are often abundant. Over 400 species are known. Reproduction is by means of single-celled spores, not seeds, which are blown about by the wind. On germination, a little motile cell is formed which swims around in dew and rain like many of the forms of lower animal life. Later these cells fuse together into a sheet-like mass of naked protoplasm, often several inches in width and frequently of brilliant color. This mass creeps up on to logs, stumps, or other elevated objects, where spores are again produced. In spore formation, the slime mold resembles a plant rather than an animal. One species of slime mold is of great economic importance, being the cause of the club root of cabbage. Unlike its relatives, this species has acquired the habit of living within the tissue of a higher plant, and is a true parasite.

The **algae** form another of the lower groups of plant life. They also do not produce seed, but simply spores. The algae, however, contain the green pigment chlorophyll, and in this respect are like the higher plants. The plant body is usually threadlike in the simpler forms, or is often in the form of single, minute, round, microscopic green cells which sometimes, because of their great number, give the appearance of green paint. In the more complex forms, the plant may be several inches or even many feet long, and branched. In the seaweeds which are marine algae the plant body is often very large, flat and ribbonlike or sheetlike, and variously forked. In many of the so-called "red seaweeds" the green color is disguised by a red pigment, which makes them objects of great beauty. There are probably 14,000 species or more of algae. Some kind or other may be found in almost every region of the earth. The green "paint" on the north side of damp tree trunks, the green scum on ponds (the duck weed is much coarser), and the pond silk or frog spittle are all algae. Algae are common in both fresh and salt waters and on wet rocks and stones. Because of the small size of the parts, a microscope is usually necessary to see them clearly. Algae are wonderfully beautiful as seen under the microscope, and very fascinating to one who is interested in the marvels of nature, not only because of their beauty, but because of the intricate methods of reproduction and the peculiar life histories. As compared with the fungi, however, they are of little economic importance to man. Irish moss used in cooking, is a seaweed. Various seaweeds called kelps are now a commercial source of potash, bromine and iodine. It is hoped to substitute the kelps for the waning saltpeter supply as a source of potash. Some

FIG. 331. Mushrooms, the fruiting bodies of a true fungus.

fresh water algae are a serious pest in water supplies as their growth in the reservoir gives a brackish taste which is unpleasant. Some prefer such odd places to live as sewers and hot springs.

The group of Fungi is a large and very important one, about 60,000 species being known. Fungi reproduce by spores and not by seeds. The manner of spore reproduction is very diverse in the different sub-classes. In the bread mold and blights the spores are borne in cases or sacs or free at the ends of the threadlike branches of the plant. In fruit mold, many mildews, and in the "cup fungi" which grow on logs, stumps and on the ground in woods, spores are also borne in tiny sacs each of which contains eight spores. In the rusts, as for instance the grain rust, spores are of several sorts but none is borne in sacs. In mushrooms, the spores are borne in groups of four on short pedicels which are thickly placed on the gill surfaces.

Fungi are very diverse in form. Many of the simpler forms consist of slender tubular filaments as fine as cobweb hairs, and with or without cross partitions in them. In others these simple or branched filaments are united in various ways to make a more complex body, as for instance the mushroom, which is made up in this way. Fungi do not contain the green pigment chlorophyll and are, therefore, unable to manufacture their own food, for which reason they depend upon other sources for their food. Fungi are therefore all either parasites or else they live on dead and decaying organic remains.

FIG. 332. A moss plant (enlarged)

Plants of this group are of great economic importance to man. They are the main cause of the decay of timber. Along with bacteria, they are the great scavengers. To them most of the important plant diseases are due. It is interesting, however, that very few, if any, animal diseases are produced by fungi, these being due mainly to bacteria. Mushrooms and some others are edible and an article of commerce. Fungi are exceedingly common everywhere. Those causing plant disease are often so small as not to be readily seen, but larger kinds such as the mushrooms or toadstools, and the woody shelf forms, are well-known objects in the forest.

Fungi are divided into the following large groups mainly based on their methods of spore production:

SUB-CLASS I. ALGAL FUNGI or tube fungi (Phycomycetes) with no cross walls in the filaments.

Order 1. EGG FUNGI (Oomycetes), with the sex organ differentiated into egg-cell and sperm sacs, as for instance downy mildew, potato blight, damping-off fungus, watermolds, etc. About 150 species are known.

Order 2. YOKE FUNGI (Zygomycetes), with the sex organs similar, as for example bread mold. There are about 190 species.

SUB-CLASS 2. THE TRUE FUNGI (Eumycetes), with cross walls in the filaments.

Order 1. SAC FUNGI (Ascomycetes), with one kind of spores borne in sacs, as for instance yeasts, truffles, black-knot, mildews, and fruit mold. There are fully 9,000 species, distributed in about 7 orders.

Order 2. BASIDIA FUNGI (Basidiomycetes), with spores in group of 4,at the ends of pedicels as, for instance, smuts, rusts, mushrooms and puff balls. There are about 18,000 to 20,000 species, classed in 4 or 5 orders.

Lichens are mostly gray, mosslike plants growing upon trees, rocks or upon the soil. They are not differentiated into stem and leaf but are upright and branched, flat and ribbonlike, or flat crustlike and closely adhering, to the object on which they grow. Lichens have the appearance of being real plants just the same as are mosses and ferns, but the wonderfully interesting discovery was made some years ago that they are really colonies of fungi and algae growing together, each necessary to the welfare of the other. These singular plants are found often in great abundance in forest, glen and shady roadsides or on the soil in sterile fields, and are very abundant northward. Many hundred species are known, but very few are useful to man. The Iceland moss, so called, is a lichen sometimes used in medicine.

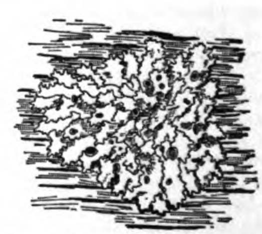


FIG. 333. A lichen on a piece of bark

Mosses and Liverworts are green plants standing closer in relationship to the higher plants than do the algae and fungi. The reproductive bodies, however, are spores and not seeds. There are definitely two stages in their life; one stage producing only sex organs and the other only spores. These two stages regularly alternate. The first stage consists of the moss plant itself, a slender stem provided with thin flat leaves; while the other stage consists of the spore-capsule and its stalks only. The moss capsule is quite complex in structure provided with a cap, a lid, and 1 or 2 rows of teeth around the mouth, which move back and forth with the varying dampness of the air. In this way the distribution of the spores is regulated.

Mosses occur in damp situations everywhere, but are especially abundant in cooler

and mountainous countries. They festoon the banks, fallen logs, and tree trunks in the deep forests or glens, with delicate green. Some are modified to grow in very dry situations, while the peat moss, Sphagnum, has the power to retain water so as to provide itself with a uniform supply. Peat moss occurs in enormous quantities in bogs, where it grows over the surface of the mud to a depth of many inches. Because of its water retaining powers, it is of economic importance in packing nursery stock, shipping live plants and cut flowers, and also to the florist in germinating seeds. In the Great War, it has become of much importance as a surgical dressing because of its absorptive and antiseptic properties. Other mosses are of little direct economic value. Some of the larger have been used for stuffing mattresses and pillows.

Liverworts are closely related to the mosses belonging as they do to the same division, and would not readily be distinguished from them. Many have a mosslike appearance while some are flat and ribbonlike and not differentiated into stem and leaves. These green ribbonlike forms may be readily found on damp rocks in glens, and on damp soil where fires have occurred.

The **Ferns**, like the mosses, have two stages in the life of each plant, one bearing sex organs and the other spores only. But here the conspicuous fern plant is the spore-bearing stage, while the moss plant bears the sex cells. The sexual stage of the fern is a small thin, green heart-shaped, flat body one eighth to one third inch in diameter, lying upon the ground in damp, shady places. Ferns were much more abundant in past geological time, as, for instance, when coal was being formed, and represent an old race which is gradually becoming extinct. They are now most abundant in damp woodlands, especially in humid and warm climates. The spores are borne in tiny cases bunched together in rust-colored groups usually on the underside of the leaves. Besides the true ferns, there are also other plants in this group, called fern allies, which have a less fernlike appearance. Among these are the horsetails, the clubmosses or ground pines, the selaginellas, the quill wort, water clover and others.

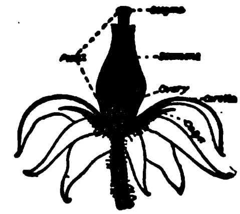


FIG. 335. Section of a flower showing essential floral parts.

FIG. 334. A fern showing rootstock or underground stem, and new and old leaves or fronds.

The so-called **Higher or Seed-bearing plants** constitute the largest group of the plant kingdom and are probably the most recent in origin. They, also, show an alternation of stages, though the structures involved have become so intricately involved that it is scarcely possible to make this alternation clear in the brief space at our disposal. A subdivision of this group is often called the "flowering plants" because here only do we find the structure ordinarily known as the flower. The flower is a much modified branch, the parts of which correspond to much modified leaves. The central organs or pistils bear the seeds in a closed pouch, and the seed is perhaps the most characteristic of the several peculiarities of the group. It consists of a young embryo plantlet which has developed to some extent, has become dormant, invested by protective coverings and supplied with food for recommencing growth. Just outside the pistils are the stamens which bear

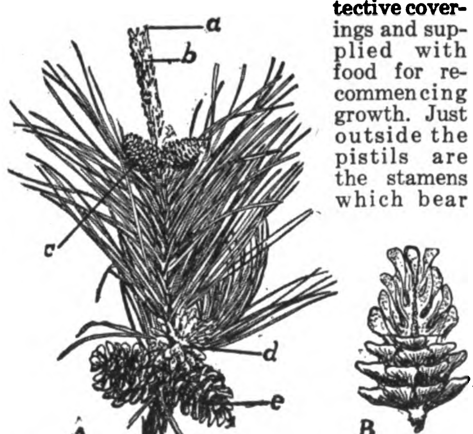


FIG. 336. A, pine branch showing very young pistillate cones (*a*) at tip of shoot (*b*); pistillate cones one year old (*c*), and two years old (*e*), the latter opening and shedding seed; and a group of young staminate cones (*d*). B, ripe pistillate cone partly in section showing how the seeds lie unenclosed in the axils of the scales.

FIG. 337. Seeds of gymnosperms and angiosperms (see text): *a* scale of pine cone with two winged, unenclosed seeds; *b* hemlock cone; *c* scale from (b); *d* mustard pod; *e* follicles of monkshood; *f* section of apple. The last three show enclosed seeds.

pollen. In the pollen are found the sperm cells, one of which must unite with an egg cell in the young seed before an embryo may be formed. The plant seems to desire that the pollen should come from another plant, so insects or the wind must be used to transport the pollen. The outer portions of most flowers, the petals, are very showy to attract insects for this purpose. The outermost envelope of the flower, the calyx, is usually green, and serves to protect the flower while in the bud.

The seed plants with open seed organs (Gymnosperms) are the pines, spruces, hemlocks and other cone bearers of our northern forests. The greenhouse Cycas or "sago palm" also belongs to this group. These plants were much more abundant in past geologic times, and now form only a small part of the seed plant group.

The seed plants with closed seed vessels, ("flowering plants") are divided into two groups, partly on the basis of the number of seed leaves on the embryo and future seedling to which it gives rise. The *monocotyledons* have one cotyledon or seed leaf, the *dicotyledons* have two. The flowers of the monocotyledons usually have their parts in sets of threes, their leaves with longitudinally parallel veins, and the stem with scattered woody strands (as in corn stalk); while the floral parts in the dicotyledons are usually in fours or fives, the leaf veins form a network, and the woody strands are in a cylinder appearing as a ring when cut across. Among the monocotyledons, are such plants as grasses, oats, wheat, rice,

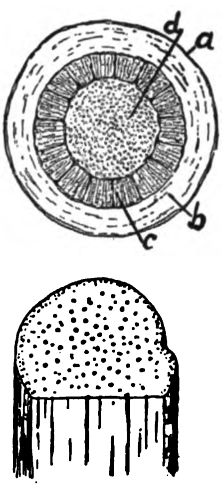


FIG. 338. Stems of a dicotyledonous plant (*above*) and a monocotyledonous plant (*below*). In the former: *a* epidermis or bark; *b* cortex; *c* vascular cylinder; *d* pith. In the latter note merely pith and scattered bundles showing as black lines and, in cross section, as black dots.

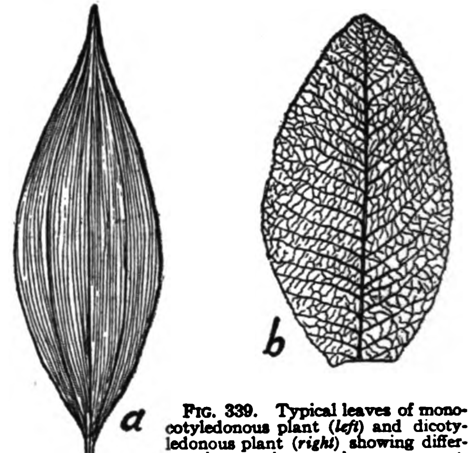


FIG. 339. Typical leaves of monocotyledonous plant (*left*) and dicotyledonous plant (*right*) showing difference in venation or vein arrangement.

corn, rushes, lilies, onions, asparagus, iris, and the orchids. Among the dicotyledons are all northern forest trees and shrubs, buckwheat, strawberry, blackberry, rose, apple, cherry, sunflower, daisy, dandelion, and very many other well-known plants. To seed plants we owe nearly all the green color of the landscape, and by far the greater number of useful plants belong to this group. Botany as it is usually studied is to a large extent a study of the flowering plants, partly because of their importance, and partly because a microscope is rarely needed in carrying it on.

Herbarium. In the study of plants, a collection is often helpful. It is frequently desirable to preserve various plants of interest. They are best preserved in the dry state, for to keep them in liquid is generally too expensive and too bulky. Only delicate fruits, algae and fungi need to be placed in liquid. The collection of dried plants properly labeled and classified is called an *herbarium*. The plants are dried between blotters under pressure, and the blotters are frequently changed and dried to prevent mold and to preserve the green color. When dry, the specimens are glued to sheets of firm white paper of uniform size, all neatly labeled in the same corner with the name, kind of locality, place, date, and collector's name. These sheets may be filed under genera, families, etc., in specially constructed cases. A

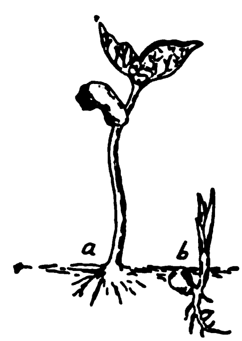


FIG. 340. Seedlings of bean (*a*) a dicotyledon, and of corn (*b*) a monocotyledon, showing the seed leaves held in the air by the first and underground by the second.

collection of this sort will be found not only useful for purposes of comparison and study, but also a source of pleasure in itself. It is a strong stimulus to one's interest in his or her surroundings.

Morphology. An important portion of the science of botany deals with the parts of plants and their uses. The study of the kinds and shapes of plants is called morphology, which means the study of form. The uses to which these parts are put by the plant is called physiology. Morphology is of two kinds: that which deals with the general external shape and configuration of plant parts, or *general morphology*, and that which deals with the internal makeup of the parts, or *anatomy*. All plants are made up of cells, and these are united into tissues of various kinds. The internal make-up of the higher plants is very intricate. Also the rôle which each structure plays in the life of the plant forms an extensive study. The farmer should know something about both the morphology and physiology of plants, as these are fundamental to an accurate knowledge of how crops grow and the way in which crops are influenced by varying conditions.

Ecology. Another phase of botany is called ecology or the study of the relation of plants to their surroundings; the effect of different kinds of soils, of varying quantities of water, of different degrees of shade, and of competition between plants. Ecology is of special value to the farmer, as it deals with most of the fundamental problems of the relation of crops to their surroundings.

Plant geography is the division of botany which deals with the distribution of plants over the earth. This is a large field of study and a very interesting one. The plants of the different countries differ widely depending upon climate and the distance of one country from another. A careful study of plant geography throws much light upon the agricultural possibilities of the various countries. One may often judge more accurately how well suited a region is for a certain crop by noting the natural vegetation than by any other means.

Uses of plants. Another phase of botany dealing with the uses of plants to man is *economic botany*. Plants furnishing useful products are studied from the standpoint of relationship, classification, structure, the method of preparation of the product, and its manner of use. To pursue this study successfully, one should be within reach of a good museum of economic products.

BREEDING

By EUGENE DAVENPORT, *Dean of the College of Agriculture and Director of the Experiment Station of the University of Illinois. After graduating from the Michigan Agricultural College, he became, first, Assistant Botanist of its Experiment Station, and later, Professor of Practical Agriculture and Farm Superintendent of that institution. For 2 years before assuming his present duties, he was president of the Collegio Agronomica, of Sao Paulo, Brazil. Although this wide experience has kept him in touch with all phases of agriculture, his special line of investigation has been the science of breeding, in which he holds a place among the very foremost authorities. While the subject has two sides—one the field of the scientist, the other that of the farmer—it is essential that the specialist in each line know something about the other. Dean Davenport tells the farmer what the science of breeding is, so that he can do more with it as an art and a practical business.*—EDITOR.

EVERY animal of the barnyard and every crop of the field, the orchard, and the garden, is a descendant, either direct or indirect, of some wild species that attracted the attention of primitive man as affording something of value in the way of food, clothing, or service. The dog for the hunt, the horse as a beast of burden, the sheep for its wool, the pig for its meat, and cattle for their milk, meat and hides, were among the earlier domesticated animals. Then came the grains, the grasses, the fruits, and last of all, the vegetables. During the long process of domestication all these species have been greatly "improved"; that is, their useful characters have been developed and strengthened, while their objectionable or less desirable traits and qualities have been more or less modified, and in some instances entirely "bred out" so far at least as practical considerations are concerned. For example, the horse is more swift and

less timid in domestication than in the wild state. Cows give more milk and milk of better flavor than do wild species. The beef breeds have thicker meat with less development of the coarser parts. The fiber of wool is both longer and finer, with a smaller admixture of hair. The grains "stool" better and yield more. Fruits are larger, sweeter, and of finer quality, with a reduction of unpleasant flavors, and of spines on wood or fruit. Vegetables are larger, of finer texture, and with a greater content of starch, or sugar,—as in the potato and the beet. Some of these changes are of long standing and others,—like those in the grape, the strawberry, and the tomato,—have come about within the lifetime of men yet living.

The success of the breeder lies in the fact that no two animals or plants are precisely alike, and that these slight differences are for the most part transmissible. By breeding from "the best," therefore, the offspring is nearer what is wanted than would have been the case had the blood lines been left to accident. Successful breeding is both an art and a science—an art, because it requires the ability to note slight differences; a science, because it requires a knowledge of the relations between characters and their behavior in descent.

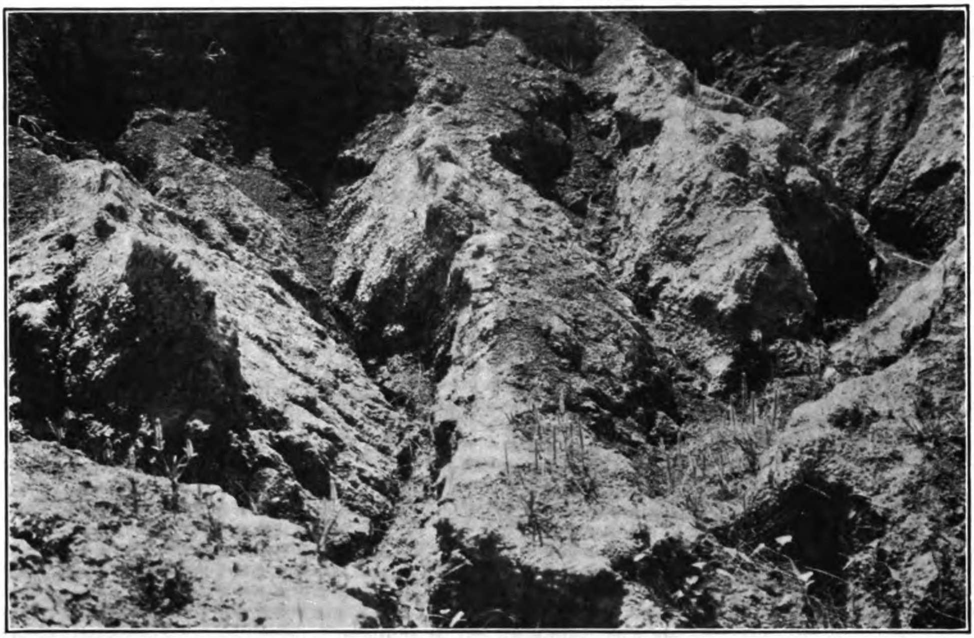
DEFINING THE OBJECTIVE. No two men would agree as to what is "best" for any particular purpose. For that reason alone no two breeders secure the same results, and it is always easy to distinguish one man's breeding from that of another even within the same breed. To decide what constitutes the "best" is, therefore, the first step in successful breeding. Of course what is best for one man or for one purpose is not necessarily best for another, but if the individual breeder is to succeed, he must first, as in building a house, decide definitely what he needs for his purpose, and then adhere to the plan, for if the principle of selection is to change with every generation, the herd cannot be uniform.

The second most important step in making a plan for successful breeding is to make the plan simple, involving as few "points" as possible. For example, if all that is required of the cow is that she shall give a heavy yield of milk, it will be very much easier to succeed than if she must also be of a particular color and bear a horn of specified size and shape. It is sufficiently difficult to find enough cows with good digestion, good health, and active mammary glands,—all of which are necessary to good milking qualities,—and every time an additional specification is attached, the problem of selection rapidly becomes complicated and correspondingly more difficult.

This fact rules out mere "fancy points" except in cases—and they are frequent—in which the breeder depends upon popular favor for his sales. In such instances, he must have regard to fashion or be driven out of business, for unfortunately, except in racing horses, there is fashion in breeding as there is in dress.

WHAT IS A BREED? When a strain has been selected for the same points and for a good many generations, it comes to be called a *breed*, and is spoken of as "pure," especially if the owners have established a herd book in which the record of all animals of this breeding can be traced. The term "purebred" is not strictly proper because all breeds "run into the woods" sometime; that is, they all trace back to unpedigreed stock where breeding is unknown, and beyond that to the wild. The term as used, however, is understood merely to denote that the "purebred" individual has no recent admixture of outside blood, and that since the improvement began he has been bred entirely within the established lines of the breed. Thus we speak of "pure" Percherons, Shorthorns, Jerseys, Berkshires, etc. The term "thoroughbred" should never be used except to denote the English running horse.

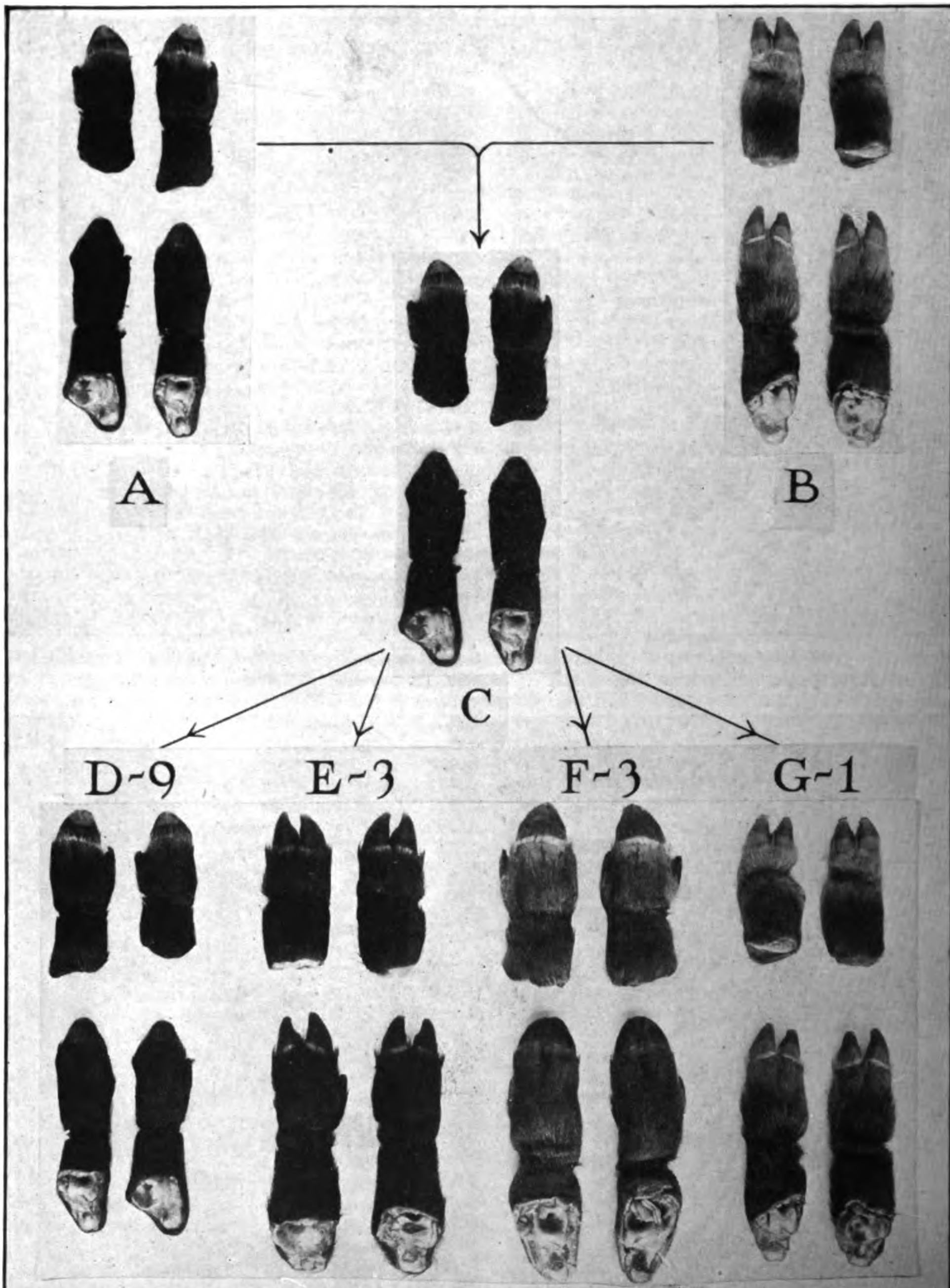
Correlated qualities. By their behavior in descent, we see that some characters are quite independent of all entanglements, while others appear to be "correlated" or bound together by bonds that are practically indissoluble. Correlations between acceptable characters are, of course, in every way desirable, for they then go "*en bloc*," but oftentimes a very objectionable quality seems inevitably linked with the very purpose of the breed. For example, a certain and considerable amount of oil is secreted by the skin of the sheep, and this amount increases with the fineness of the fiber. Sheepmen naturally desire that their feed should go to the production of wool rather than of "grease" which has little or no value; but thus far they have been unable to breed a fine-wooled sheep without considerable grease. Whether accidental or otherwise, most breeds have certain undesirable qualities that seem to be so associated with the general makeup as to be exceedingly difficult to eliminate. For example, one breed of pigs has poor hams with perfect shoulders, while the reverse is true of another breed. In this way one or more "yellow streaks" run through the physical or mental makeup of most breeds, and to get rid of these without



Destructive soil erosion is not an unhappy, unreasonable freak of Nature, but the inevitable result of physical laws acting where ignorance or carelessness has paved the way

Chemistry has shown us how to treat seeds so as to destroy bacteria that produce disease, and also how to treat them so as to multiply others that increase the supply of nitrogen in both soil and plant

THE SCIENCES ARE NO LONGER MYSTERIES TO BE STUDIED SOLELY FROM BOOKS WITHIN BRICK WALLS. THEY ARE PART OF THE STOCK-IN-TRADE OF EVERY SUCCESSFUL FARMER



An Illustration of Some of the Principles of Breeding as Applied to the Transmission of Characters in Farm Animals. A and B are the Original Parents; C the First Generation From the Cross; and D, E, F and G the Progeny Making Up the Third Generation. See Page 400 for Complete Explanation

disturbing the other qualities, is the constant aim of the professional breeder.

Grading is the practice of putting pedigreed sires at the head of unpedigreed herds. When this is done, the first generation of offspring will possess one-half the blood of the sire and will be called "half-bloods." Thus by buying a single animal the owner gets, the first year, one half the supposed benefits of the pure-bred so far at least as utility is concerned; that is, if the animals represented by the sire are better feeders or better milkers, or bear better wool than the unimproved herd or flock of the farmer, one half of this advantage would be secured at once and by the purchase of only one animal.

If these half-bloods should be bred together, they would manifestly remain half-bloods, and all improvement would be at an end except as the owner should practise selection. Some selection is always needed, but the stockman can do far better than to stop at the first step, for if these half-bloods in their turn be bred to a full-blooded sire, their progeny will be three-quarter bloods; the next generation, seven-eighths, and so on until, in a few generations, the fraction of "unimproved" blood remaining is negligible. So by grading does the farmer quickly and cheaply secure nearly all the advantages of the pure-bred so far as performance goes, and that too by buying only one animal at a time. Indeed, if he has bred in rather large numbers and practised rigorous selection, he may produce a herd of grades that are actually better performers than are most of the full-bloods, and it is the performance test that indicates the commercial value of livestock.

Manifestly there will always be a remaining fraction of unimproved blood in a herd produced by grading or "grading up" as the phrase goes. For this reason the grade is never eligible for registry, and should never be used for breeding except upon inferior herds. It is a general principle that the sire should, if possible, come out of a breed greatly superior to the one he is called upon to head. So shall he do much good and prove a wise investment.

Crossing, or the mixing of two distinct breeds, is the abiding temptation of the amateur, as it is the favorite theme of the uninformed writer, who assumes that the results of the labors of a man like Burbank are the outcome of far-seeing combinations of "blood lines," whereas they are mostly due to the selection of those fortuitous combinations—like albino deer, white blackberries, spineless cacti, etc.—that arise in nature where animals and plants are breeding together in large numbers. These "mutations" are constantly occurring both in nature and in the breeding yards and fields, and it is a fine exercise of the breeder's art to detect and bring out those that possess real value. However, that is quite independent from the business of producing these strains artificially. Crossing aims at the production of new strains, not by gradual improvement of an existing breed through selection, but by actually uniting two distinct breeds in the hope of securing something better than either by combining the good qualities of both, as for example, attempting to produce a cow that will give as rich milk as the Jersey and as much of it as the Holstein-Friesian.

PRACTICAL DIFFICULTIES. As a matter of fact, the problem of improvement is not so simple as it might seem. There are several reasons why so desirable an end cannot be so easily accomplished as is popularly supposed. In the first place, to expect a cow to give as rich milk as does the Jersey and as much of it as does the Holstein-Friesian, is to ask her to do double duty. To expect a horse to go as fast as a racer and at the same time to pull as much as a Percheron, is to attempt to bring together two incompatible qualities, —namely, high speed and extreme weight. Secondly, every breed has remaining in its makeup a number of more or less undesirable characters that the breeders have never been able wholly to eliminate, but only by the most vigorous selection to keep down, or "latent" as the phrase goes. So thoroughly are some of these latent characters suppressed that their presence would never be suspected. For an extreme example: Most English breeds run back to wild white cattle with red ears. While such specimens almost never occur in registered herds, crossing is likely to bring out even these "long-lost characters"—not lost in truth, but well suppressed until in the new shuffle they come to the surface and, to the

FIG. 341. Practical plant breeding in the field: cross fertilizing wheat in experiments aiming at the production of better varieties.

surprise of the owner, the result of the "cross" is a nondescript thing that nobody wants. Again, characters frequently refuse to blend, and as a consequence all sorts of unexpected things may happen in crossing. For example, the writer once saw a span of horses bred from a Clydesdale stallion and a matched span of trotting mares. Both were of good size but the front end of one and the hind quarters of the other were distinctly Clydesdale while the remaining parts were trotter. The span looked as if a Clydesdale and a trotter had in some way been divided at the middle and the ends mismatched.

LAW OF RESULTS. In general, if large and small breeds be crossed with a view to increasing the size of the smaller, the first result may be and often is a medium that is satisfactory. But when these crossed forms are bred together with a view to increasing numbers and to fixing the medium size, the stockman is surprised to find that the progeny breaks up into three forms—one large like the one parent, another that is small like the other parent, and a third that remains medium. If now he discards the large and the small and attempts to fix the medium size by breeding only mediums, he finds again the same phenomena, for this generation, like all others produced from the crossed stock, will be of the general formula,—1 large, 2 medium, 1 small.

Examples might be multiplied indefinitely to show that characters do not always blend in descent, but that often each tends strongly to preserve its identity so that descent is "bit by bit." Therefore when two widely different breeds are crossed the result is commonly not a blend or medium between the two. Even though the progeny may seem to be in the first generation a perfect blend, yet when bred among themselves in the attempt to establish a new breed, it will commonly be found that the descendants break up into three more or less distinct forms.

The proportion of these three groups is constant and interesting. In general, one fourth resemble one parent, one fourth the other, and those resembling neither, or rather showing traces of the influence of both, constitute one half of the whole. This ratio 1:2:1 is the well-known ratio between simple unit characters that do not blend. This is "segregation," and as it is the common behavior, it tends to prove that most characters are units that do not blend in descent but preserve their identity, even though "latent" for a time, reappearing with mathematical regularity.

In the illustrations of segregation, an example was chosen of a character that behaved as a unit. But often in practice what we recognize as a character is made up of several factors, as we know from the fact that it can be broken up and animals bred which show all these various factors separated out in the individual.

For example, the familiar dun color of wild mice is not a real color unit, but is the result of four color factors. If all are present, the dun color results, but if one or more for any reason happen to be absent, a differeht color results. In laboratory experiments, a great variety of colors can be produced at will and in proportions that can be predicted in advance. Curiously enough the binomial formula with the appropriate expansions will express numbers and relative proportions of all combinations that arise in crossing.

Dominant and recessive characters. If all characters were equally prominent and evident, the exact composition of each group would stand clearly out. For example when black is crossed with white, the formula is usually 1B, 2BW, 1W, and each group is easily separated. Manifestly, if a red flower should be crossed with a light pink, the formula for the descendants would be 1R, 2RP, 1P. But when it comes to separating the groups, difficulty would arise in distinguishing the pure reds from the mixed red and pink because the stronger red covers up and makes practically indistinguishable the more delicate pink. This being the case, such a crossed population would be separated into two groups, a red and a pink, the red being three times as numerous as the pink. Of course the breeder knows that two thirds of the supposed reds are actually red and pink, but the only way to separate them is by the breeding test.

This overshadowing of one character by another is called "dominance," and the character that overshadows is called "the dominant," while the other is called "recessive." If the desired character happens to be a recessive, it is easily segregated and bred pure, but if it happens to be dominant, its separation from the recessive is a long, laborious job.

The illustration on page 398 and the following extract, which illustrate these matters, are from the unpublished material of Detlefsen and Carmichael of the University of Illinois. They afford a concrete illustration of the manner in which characters behave in crossing:

"The fact that animals and plants may transmit their characters as units can be brought out clearly in domestic animals. If we cross a pure Mulefoot boar with Duroc-Jersey sows, we can follow, among many others, two contrasted pairs of characters coming from these two diverse stocks. The Mulefoot is black (A), whereas the Duroc-Jersey is red (B); furthermore, the Mulefoot has the well-known syndactyl (one-toed) condition in which the digits are fused, whereas the Duroc-Jersey has the cloven hoof (A and B). In the cross, black is dominant to red, and mulefoot is dominant to cloven hoof; hence the crossbreds (C) are both black and mulefooted. Following each pair of contrasted characters separately, we may say that, when these cross breds are mated together,

FIG. 342. Plant of the native wild potato found growing in Colorado. The watch emphasizes its small size as compared with cultivated forms.

they give in the long run: 3 blacks to 1 red, and 3 mulefooted to 1 with cloven hoof. If we follow both pairs of characters simultaneously, we find the crossbreds give on the average 9 black mulefooted (D) + 3 black clovenfooted (E) + 3 red mulefooted (F) + 1 red clovenfooted (G). If the crossbreds are mated back to Duroc-Jerseys, they throw the same four classes in *equal* numbers.

"Not all other characters are transmitted in this simple fashion, for we find many, many complex cases where the interpretation is similar although not so simple. This illustration is a good example in simple terms of several important facts frequently observed in breeding:

"1. Crossing purebreds and then using the crossbreds for breeding purposes, will break up uniformity of type and lead to subsequent variability. This is not only predictable, but the various forms to be expected and their frequencies can by close study be predicted.

"2. New recombinations of characters are not only given to us in this way, but their probable frequency of occurrence is known. Furthermore, one can predict what any animal with a given combination of characters will throw in the next generation; for example, the animal, in Fig. F will throw only red when mated to its own kind, but as to toes, will throw both mulefoot and normal cloven hoof."

The discussion has dealt with but one character in each parent, but it must be remembered that each parent has a great variety of other characters, good, bad, and indifferent, dominant and recessive, all of which go into the makeup of the crossbred progeny. By this it is seen that while crossing offers wonderful opportunities for improvement, the problems involved are extremely complicated, and nobody but the trained experimenter is likely to get results by this road unless it be by merest accident.

The indefinite piling up of generation after generation of characters that tend strongly to preserve their unity, makes breeding an exceedingly complicated art, and knowledge of these facts is what makes older breeders extremely shy about interfering much with those breeds that have been fairly well established by long-continued selection.

The novice, on the other hand, is continually talking about crossing, not realizing that so far as we have fairly satisfactory strains, our greatest progress will lie in still further improvement by continued and consistent selection always reducing the remains of undesirable traits,—hence the value of established breeds.

FIG. 343. Average potatoes compared with seedballs from the plant shown in FIG. 342 which produces no tubers.

THE BUSINESS OF BREEDING. The business of producing new strains or of improving old ones, is a special line to be undertaken only by those who have plenty of means and whose time can be entirely devoted to the study of the multitude of slightly differing individuals that will appear, every one of which must be made the object of careful study lest a worthless specimen be kept, or, what is worse, a record maker be lost. The farmer having many interests should take over breeds and strains as he finds them in the hands of specialists, and do the best he can to prevent deterioration by going constantly back for new breeding stock, especially sires. If in this way the ordinary farmer can hold his stock level he will do well. The mass of farmers will never raise pedigreed stock. Their chief interest is in other things than livestock, which are kept not for their own sake but as a means to an end,—to market crops, consume waste, make manure, etc. The ordinary farmer will keep unpedigreed stock, if for no other reason than because they are cheaper, knowing that nobody would buy his pedigreed animals at more than ordinary market price. He will raise common, often wrongly called, "scrub stock." Such a man should not raise real "scrub stock," however. He cannot afford to feed good corn and hay to inferior animals, neither can the country afford to have him do it. He should always use purebred sires and depend upon grading to hold his stock at a reasonably high level. This he can afford to do, for it requires nothing extra from him except the occasional purchase of a pedigreed sire, which will many times pay for himself.

Inbreeding. Too many uninformed people are afraid of a little inbreeding. There is an unreasoning horror of bringing together blood lines closely related, expressed in such aphorisms as, "nature abhors incest," or in laws that forbid the marriage of cousins. As a matter of fact there is no evidence that close breeding of itself is in any way detrimental. Of course, related lines are somewhat more likely than unrelated to possess *the same defects*, and for this reason they should be closely scanned, but the best results in animal improvement have been obtained by the closest breeding, even of brother and sister, sire and dam. Incest is a moral not a biological sin and, if the stock is good, the breeder may use it quite regardless of consanguinity.

GEOLOGY

By ELMER O. FIPPIN, *formerly Professor of Soil Technology, Cornell University, who wrote the chapters in Volume II on Soils. Edited by* O. D. VON ENGELN, *Assistant Professor of Physical Geography, also in Cornell University. The relation of rocks and soils is so close, and the characters of the one have such an important bearing on the formation and nature of the other, that it is especially gratifying to have had the subject considered by two authorities whose special interests lie along each of these directions. The farmer may not often realize that in handling soils—whether building them up or ruthlessly running them down—he is dealing with materials that have been thousands, possibly millions, of years in the making. Such, however, is the truth, and one that throws a new light on his tasks and responsibilities.*—EDITOR.

WHAT geology is. Geology treats of the materials of which the earth is composed, their nature and structure, of the forces by which these have been developed, and the age and relationship of their constituent parts. Physiography, which is a branch of geology, has for its particular field the investigation of the form that these materials have on the surface of the earth—that is, the origin of the hills and the hollows and all the other irregularities of the land that give the landscape its different aspects. Geology touches the farmer in innumerable ways. The soil that he cultivates is part of the structure of the earth, and its character is in part determined by the nature of the rock substance from which it has been derived, in part by the changes in that material brought about by various natural processes. Curiously enough, the same processes in turn are largely responsible for the occurrence of the solid rocks that yield the soil. The form of the earth, the steep slopes and the flat plains that so much affect farm operations are the result of the changes to which the earth materials have been subjected. The crust of the earth is in places crumpled up into both small and great folds, some of which reach mountain height. The elevated parts of such folds have often been completely worn down by the long-continued erosion of running water, by the grinding of ice in the form of glaciers, by the action of the wind, and, lastly, by the waves. Most great valleys have been formed by the cutting of rivers supplemented by the decay and crumbling due to the action of the weather. Mountain heights are often simply the projection of the remnants of rocks left behind in the cutting of valleys.

FIG. 314. Mountains may be thought of as projections of hard rock rising out of a softer, more easily weathered surface.

The water supply on the farm depends very much on the structure of the rocks. Porous rocks and soil material afford the reservoir for a large amount of water that is the source of springs. This underground supply of water may also be tapped by wells.

The climate, especially the local climate, is very much affected by the form of the land and the position of large bodies of water, and in their relation to the general movement of the wind. Hollows are generally subject to early and late frosts. High points have a colder climate than low areas. High hills and mountains may withdraw the moisture of the atmosphere on one side by deflecting the wind upward so that it is cooled and its moisture content condensed and precipitated as rain or snow. On the opposite side of the elevation

—the lee side—the climate may then be dry, even arid. One of the most striking examples of this particular phenomenon is found along the northwestern part of the United States. The arid and semi-arid climate of much of this western half of the country is due to the fact that high mountains rise in almost unbroken ranges parallel to the Pacific Coast. The seaward slopes of these ranges in northern California, in Oregon and in Washington, have the highest rainfall of any part of the United States, while the inter-mountain valleys only a few miles inland, such as the Sacramento and San Joaquin Valleys, the so-called great American desert of central Nevada, and many other similarly situated valley areas, have an exceedingly dry climate.

The successful growing of apples, peaches and grapes in most of the centers of large production is made possible by a similar adjustment of climate to the land form and its relation to bodies of water. A notable example of this is the Chautauqua grape belt in western New York, comprising a narrow, low plain that fringes the southeast shore of Lake Erie and is backed by a steep bluff. The lake, together with the prevailing direction of the wind, so regulates the temperature and the humidity of this area as to develop a climate particularly suited to the vine.

The building stones, road materials and the various rocks, minerals and ores used in chemical industries have all had a particular geologic history, and have thus acquired a definite place in the earth's structure. Limestone, salt, gypsum, rocks from which cement is made, sulphur and phosphate rock, iron, zinc, copper and lead may be mentioned as examples of such deposits. Coal derived from the accumulation of plants, and the oil and gas that are probably due to the distillation of coal by pressure and heat, are further illustrations.

Structure of the Earth.

The soil is the last thin covering of the hard rock structure of the earth. Considered in relation to the size of the earth, the soil cover is very thin. Estimating the total average depth used by plants at 10 feet, this would be a layer not over one seventieth of an inch or a "hair's breadth" in thickness on a sphere a mile in diameter, and the earth itself has a diameter of nearly 8000 miles. From this thin layer man and animals derive their plant subsistence. But in many parts of the world and over the greater part of those areas where agriculture is practised, ten feet in depth does not reach solid rock. There lies below the actual soil a thick layer of essentially unconsolidated rock debris that commonly passes under the name of subsoil and is composed of clay, sand, gravel and loose stones. A name that has been proposed for this entire layer of slightly consolidated rock material is *Regolith*, a Greek word meaning literally a stone blanket. If the variably thick but always relatively thin layer of the regolith be stripped off, it will be found that everywhere below the earth's surface a continuous mass of solid rock material occurs. This is bedrock. The consolidated rock extends downward for many miles.

Temperature. Wherever men have penetrated the earth with mines, tunnels and deep wells, it has been found that the temperature rises with depth. At about 60 feet below

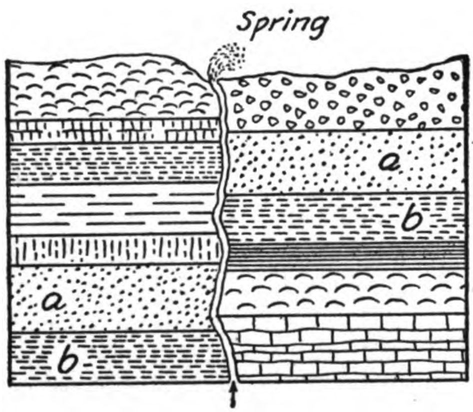


FIG. 345. One result of the movement of the earth's crust is the breaking and shifting of rock layers and the creation of cracks (fault planes) which sometimes permit the escape of water as springs.

the surface, the temperature is approximately constant, the seasonal change on the surface being neutralized by the heat from below. The average rate of increase below 60 feet is one degree Fahrenheit for each 60 to 75 feet. If this rate of increase in temperature continues indefinitely inward toward the center of the earth, it will readily be perceived that at a depth of only a few miles, the temperature would become sufficiently high to

FIG. 346. Joint planes provide entrances for weathering agencies.

melt even the most resistant rocks. It is upon the basis of this knowledge of the rise in temperature, and because of the occurrence of volcanoes that pour out melted rock, that the interior of the earth is considered to be very hot, though probably not in a fluid condition, for the great pressure of overlying material apparently keeps the interior mass rigid.

Density. The earth as a sphere has a rigidity, as indicated by tidal phenomena, greater than that of the hardest steel. The large interior mass is also very dense. The surface rock material with which we are familiar is about 2.7 times as heavy as water, while the earth as a whole is 5.5 times as heavy as water; hence, to balance that of the light shell, the interior must have a density 7.7 times as great as water.

Movement of the crust. The crust of the earth—the bedrock material that continues as deeply as men have penetrated—is probably subject to continual up-and-down movement. Some parts are now moving faster than others, so fast in fact that the rate can be measured. On the coast of southern Sweden the land is rising at the rate of 2 or 3 feet in a century. Parts of the coast of Scotland and of our Atlantic Coast are thought to be sinking. The gorge of the Hudson River extends out to sea for a hundred miles and must have been formed when that area was above the sea.

FIG. 347. Sometimes earthquakes cause cracks in the ground like this—or larger.

Results of such movements are the formation of continents and mountains. While the up-and-down movement of the crust of the earth is slow, it none the less involves a vast extent of movement. Great parts of continents and islands appear above the ocean and may later disappear as a result of both erosion and of sinking. The North American continent is far from being a permanent land area. Most of its surface is known to have been below sea level. The lower Mississippi Valley and the Gulf Coast region are both very young as geological time goes.

The cause of such movement is not definitely known but is considered to be due primarily to the cooling of the earth and its consequent shrinkage. The rocks that have become solid at normal atmosphere temperature do not continue to shrink as rapidly as the hotter parts of the earth below. The outer crust consequently is continually becoming too large for the interior and it must, therefore, adjust itself to the contracting interior mass by wrinkling or folding. This is one of the reasons for the formation of mountains, and it also accounts for great depths of the ocean basins. Folding and wrinkling, whatever the cause, is plainly seen in the structure of rocks in such old mountain regions as the Appalachian where even thin strata have been thrown into the most intricate of folds. On the eastern side of the Hudson River in eastern New York, the stratified rocks stand on edge instead of horizontal as they were laid down.

FIG. 348. An extinct volcano showing cone-shaped body and crater or opening.

Joints, Faults, Earthquakes and Volcanoes

The bending and folding of rocks result in cracks or fissures. In every quarry the quarry men use these fractures or *joint planes* in getting out the rock. If a break occurs suddenly, there may be a jar that is transmitted through the earth and is known as an *earthquake*. Sometimes the edges of the rock that are fractured slip by each other so that they no longer correspond on the two sides. This gives rise to what is known as a *fault* in the rock. Severe earthquakes are frequently the result of a large deep fracture with some faulting or displacement of the rocks. As a result of the *bending* of rocks that were laid down horizontally, their strata are inclined at various angles. The angle at which a stratum of rock slopes is called the *dip*. The di-

rection in which the edge of such an inclined rock layer extends is known as the *strike*. These terms may be made clear when applied to the shingles on a roof. The slope of the roof is the dip. The ridge is the strike.

Volcanoes. Under certain conditions, reservoirs of molten rock develop near the surface of the earth and, because of the pressure of included gases, may break out through the surface rocks with explosive violence. Such a breaking forth is a volcano and the phenomenon may be accompanied by extensive fractures of the crust, faulting and severe earthquakes. Great masses of rock, both shattered surface rock and molten material, may be thrown out of volcanic craters with great violence. Large volumes of molten rock or *lava* frequently break out of the side of a vent and flow over the adjacent country. Thousands of square miles in the states of Idaho, Washington and Oregon are covered by material of this sort. On the islands of Hawaii are vast fields of such lava so recently exuded that it is still red hot and steaming

FIG. 349. The effect of weathering on a rock made up of hard and soft portions. The latter wear away first, often undermining the former.

a little way below the surface. Great quantities of gas are frequently discharged which are occasionally poisonous. This was the case in the eruption of Mt. Pelée on the island of Martinique in the West Indies. Here the city of St. Pierre was so completely enveloped in hot, poisonous gas from the eruption that, of a population of 30,000, only two persons survived.

Frequent, also, is the intrusion of lava into fractures in the rocks below the surface, both vertical and horizontal. This molten material cools in its new resting place. Such masses of one-time molten rock that cut rocks of a different kind are known as dykes. In the course of time, if the adjacent rocks are less resistant and are worn away faster, the sheets of intruded rock are exposed at the surface and may give rise to considerable eminences. The Palisades of the lower Hudson River are of this origin.

Plateaus. As a result of the folding and unequal elevation of the crust of the earth, areas that were once far beneath the ocean now form high mountain or plateau regions.

FIG. 350. A volcano in active eruption. Steam and ashes are thrown many miles in the air. Lava or molten rock flows out of the crater and down the slopes.

That this is so is shown by the occurrence of great beds of stratified rock that are known to be formed only beneath the sea but now found hundreds and even thousands of feet above sea level. Limestone is one of the best examples of such a rock type now often found at high elevations.

Decay and Erosion of Rocks

Mountains, in the sense of elevated lands of limited level summit area, are formed by the wearing away of the surface of the earth by streams, as well as by the wrinkling of the crust. This wearing-away process is greatly aided by the decay and weakening of rocks. Far from being permanent, rocks decay like wood, though by different processes. A number of agencies are at work disintegrating the solid bedrock, especially those portions near the surface of the earth. The constituent minerals are *dissolved* in the rain water. Some of these minerals are more easily dissolved and changed chemically than others, and since the change is usually one giving rise to softer minerals, the rock structure is weak-

FIG. 351. The slow weathering of a granite ledge. Frost, rain, wind and plants—each plays its part

FIG. 352. Clay cliffs in the semi-arid Southwest, carved by occasional rains

ened. Thus, the bedrock mass is made crumbly and its particles are then readily carried away by running water. Some rocks, for example limestone, are rapidly and completely dissolved, and as a result caves, caverns and galleries are formed underground. Of such origin is the Mammoth Cave in Kentucky. *Frost* is exceedingly destructive. As all rocks are somewhat porous and, consequently, take up water, they invite destruction. When the absorbed water freezes and expands, it shatters the rock. Another destructive agency is sand driven by the wind which acts like a file in *wearing away* even the hardest rocks. The fine particles that result can in turn be carried away both by wind and by water. The roots of trees and other plants pry into every fissure in surface rocks and by their expansion during growth widen the fractures. Decaying organic matter added to natural waters increases their solvent power on rock minerals. Moreover, the entire chain of destructive processes acts simultaneously and in coöperation to bring about the decay of rocks. When it is remembered that these weathering processes act in conjunction with the erosive action of every rill, creek and river, the water in which is armed with the sediment it has picked up and that it uses as tools for its scouring action, it is easy to understand that every kind of rock must yield to much de-

FIG. 353. Diagram showing how residual soil is formed

structive attack. In this manner weathering and streams are able to cut great gashes or valleys into the bedrock masses. Go to the top of the higher hills in almost any section of the country and note the valleys that have been carved out between the hills. The course of the stream and the nature of its cutting may have been guided notably by the natural structure of the rock, by the alternation of hard and soft layers, by the presence of joints, dykes and folding. But the main point is that great masses of the bedrock have been carried away. Great mountain systems have been destroyed and the resulting waste cast into the sea by these simple processes that may be observed in every field after a rain and along every water course. The Catskill Mountains in New York, the Bad Lands of the Dakotas, and the vast panorama of cañons on the Colorado River have all been sculptured to their present form by the crumbling due to weathering and

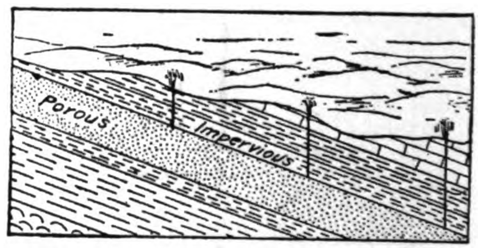


FIG. 354. Diagram showing how artesian wells occur where rock layers of varying degrees of hardness have been inclined by heat and pressure.

the erosive action of streams acting on elevated areas of land.

Rock decay in relation to soil. It is evident that there must be a continual mixing of different kinds of rock material as well as a sorting out of particular constituents, so that a soil casually examined in the field may be a collection of fragments from hundreds of square miles of rock. One of the most notable effects of water is the sorting of the material it handles. As its velocity of flow decreases, it first deposits the coarse and then the finer materials it is carrying. The clay and the silt—the very fine materials—are separated from the sand. The sand in turn is dropped according to its fineness. The gravel and coarser stone are placed by themselves also according to size. The general result of such sorting action is the accumulation of the materials in layers of various kinds, one on top of the other. Even so incomplete an understanding of these processes and of the materials upon which they operate as these few paragraphs afford, will give one a better conception of the soil, and will often aid one in understanding its character and variations.

Kinds of Rock

Mention has been made of bedrock and that it is variable in character. This calls for a further explanation. Rocks, the solid bedrock material, may be classified in three general groups. First, those that have been formed by the cooling of molten material called *igneous rocks*. Second, those that have resulted from erosion, and the redeposit of the resulting fragments of earlier rocks. These have been laid down either by water or by wind in layers or strata and are known as *stratified rocks*. Third, those formed from either of the first two groups of rock by changes subsequent to their formation resulting from pressure, often accompanied by high temperatures. These forces often totally change the original character of rocks. Accordingly, such rocks are called *metamorphic rocks* from meta, change and morphic, form.

Igneous rocks are of many kinds. Most of them on close inspection reveal different kinds of crystals or minerals. Each of these mineral constituents has a definite chemical composition and a definite crystal form. Granite and trap rock are among the best known varieties of the igneous group of rocks.

Stratified or sedimentary rocks have been deposited by water or wind. The water deposits may be formed by either mechanical or chemical processes. The mechanical deposits were made up of layers of gravel, sand and clay, and formed respectively conglomerate or puddingstone, sandstone and shale.

The chemical deposits were thrown out of solution in the water as precipitates. Examples of these latter are some limestone and all salt and gypsum beds.

Metamorphic rocks result when either of the preceding classes are deeply buried and subjected to great pressure and heat, perhaps in connection with the folding of the rocks. By those forces their character is often greatly changed. Sandstone is further consolidated by the pressure and partial melting, and forms the very resistant rock, quartzite. Shale is changed to slate and its quality of splitting in sheets is developed. Limestone is changed to marble, and peat is changed to coal. Granite and other rocks may be changed to rocks with a banded structure—gneiss and schist.

The water-table. In humid regions the entire crust of the earth, both the regolith and bedrock material, at only a short distance below the surface is saturated with water. Some of this water is contained in the actual pores of the rocks and much larger amounts occur in the fissures and cavities. The source of this water is the water that falls on the surface of the earth as rain or snow. Part of this runs off the surface or evaporates. The remainder sinks into the earth and continues to move laterally and downward at a reduced rate. Immediately after a heavy rain the regolith and bedrock are saturated up to the very surface, but in the succeeding clear days this water sinks away from the surface to conform to the general level of the permanently saturated reservoir below. The top surface of this zone of permanently saturated rock is known as the water-table. It conforms in a general way to the topography of the surface of the land above, but lies deeper under hills than under slopes and valley bottoms. It comes to the surface at the edges of lakes and rivers. The appearance of this underground water at the surface due to a variety of conditions gives rise to springs. Wells sunk below the level of this underground reservoir of water find a permanent supply. Where the water is trapped in a porous rock, by an overlying impervious rock and conducted to great depths and to a much lower level, it develops a high pressure and may be tapped to form a flowing or artesian well.

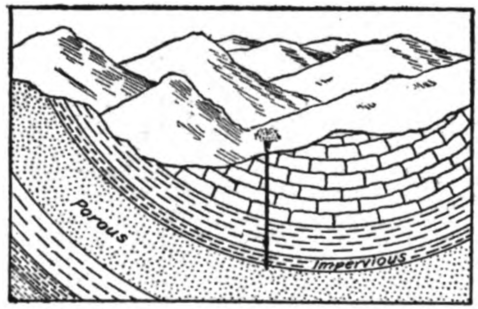


FIG. 355. Another set of conditions producing artesian wells, in which the rock layers have been bent or folded

Oil and gas are also stored in the porous rocks where they are retained by a covering or other enclosure of impervious rocks, commonly shale.

The Age of Rocks

The age of rocks is determined in part by their relative positions. Usually the lower rocks are older than the upper ones. But the relative position of rocks is not always clear, due to the folding and tilting they may have undergone. Another method of determining the age of stratified rocks is by means of the fossils they contain. A fossil is any remnant or impression of a plant or animal form. Certain plants and animals are characteristic of each age of rocks. In the arrangement of the layers and in the fossil forms the layers contain, much of the geological history of the earth is recorded. From this record it is known that many kinds of plants and animals have developed and flourished for a period only to disappear later. Many of our present forms began their careers far back in those ancient times.

ERAS	PERIODS	EVENTS
Cenozoic	Recent Pleistocene Tertiary	Glacial epoch Sierras and Coast ranges formed.
Mesozoic (Age of reptiles)	Cretaceous Jurassic Triassic	Rocky Mountains formed at close of period
Paleozoic (Abundance of lower forms of plant and animal life.)	Permian Upper Carboniferous Lower Carboniferous Devonian Silurian Ordovician Cambrian	Appalachian Mountains formed
Proterozoic	The beginning of life. Ancient continent of Appalachia, now represented by a remnant. The Piedmont plateau then had its largest extent.	
Archeozoic	No definite evidence of life.	

Main divisions. The above table* shows the main divisions of geological time (oldest at bottom) with an indication of the nature of the life forms that flourished in the several periods and of some of the associated geologic events in the formation of the North American Continent.

FIG. 356. A glacier in the Alps in Switzerland, showing the snowfield in the mountains, the ice-stream flowing down the valley, and the medial moraine or collection of earth, rock, etc., down its center.

The glacial epoch. The most recent episode in the geological history of the earth was the development of great glaciers that covered enormous areas of both North America and Europe. Similar ice sheets still persist in Greenland and over the Antarctic Continent. As ice accumulates in increasing depth it eventually develops so great a pressure that it begins to flow at its bottom and outer edges. If the slope of the country is down hill from the center of ice accumulation, gravity increases this flow action as in the case of small mountain glaciers. During the Glacial Epoch great glaciers developed in Labrador, on the west of Hudson Bay and in the western mountains of Canada in North America, and in Scotland, Norway and Sweden of Europe, of such vast mass that they flowed out over the country southward and westward for hundreds of miles regardless of its topography, overtopping the highest mountains of Maine and the Adirondacks. There is abundant evidence that glacial ice from the Labrador and Hudson Bay centers pushed its way southward—advancing farthest in the valleys and over plains land, but retarded by the hills and mountains, so that eventually it reached a line passing through New York City, northeastern Pennsylvania, Olean, N. Y., Cincinnati, St. Louis and thence along the course of the Missouri river. The Glacial Epoch was not a single incident, though one of its advances may have lasted thousands of years. There is evidence that there have been four such advances of glacial ice followed by retreats of the ice as the result of melting, separated by thousands of years.

Effect of glaciers on the surface of the earth. The ice reached thousands of feet in depth and acted as a great mill. It swept away the ancient soil, picked up and ground up rock and carried the material far to the southward where it is mixed with material from other rocks. The fine material ground up by the ice and mixed with boulders is frequently called *rock flour*. That which was deposited below the ice as it melted, is called ground moraine or *boulder till*, and is usually quite compact. That piled up at the margin of the ice where it melted forms *morainic ridges*, and such masses are likely to be loose, partially stratified and with a pitted and uneven surface. As the ice melted and retreated, great rivers and immense lakes were frequently formed in which the material brought in by the ice was sorted, transported and laid down as *stratified clay, sand and gravel*. The shores of these ancient lakes are clearly marked by gravel bars, such as surround Lake Ontario and Lake Erie a few miles back from the present shore line.

Agricultural interest. The effect of the glacial incursion on the soils and agricultural

* Based on data in "Geology: Physical and Historical" by H. F. Cleland, 1916.

possibilities of a region was very great. First of all, rocks were ground up without the loss of their plant-food constituents. Hence, glacial soils are relatively rich in such constituents. Of course, this depends very much on the kind of rock the ice acted upon. If it happens to be a lean, hard, old sandstone instead of a granite or limestone, the soil may be very poor. Usually there was enough mixing of material from different kinds of rock to insure a fairly good soil. It should be noted that in glacial regions the soil may bear very little relation to the bedrock on which it rests. Second, valleys were filled and ridges planed down. The surface was rendered more level in general. Regular valleys were largely obscured and many pits and blind hollows were left in the surface of the land. In these have formed innumerable lakes and deposits of peat and muck. Swamps are numerous due to the obstruction of former drainage lines. The streams in the glaciated area have often very irregular meandering courses.

Much of the best agricultural land of the world owes its origin and characteristics to glacial action. The famous corn and wheat soils of the middle-western United States are of this origin. Though much of the area of New England and New York is far from being ideal agricultural land, the soil has been greatly improved in depth, in smoothness of surface and in quality by the glacial incursion.

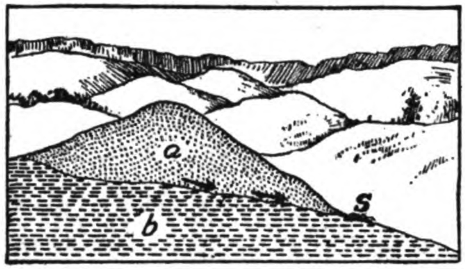


FIG. 357. Showing why and how a spring (S) often appears on a hillside in which a porous stratum (a) overlays a layer of impervious rock (b). The moisture seeps readily through the former along the surface of the latter.

Glacial soils. In general, glacial soils are stony, due to the inclusion of fragments that have not been pulverized. They are also highly variable—clay, sand, gravel, and many grades of loam frequently occur in close proximity. Wherever limestone enters into the material used by glaciers, the soil is much improved. For that matter, most soils formed from limestone are above the average in productive capacity.

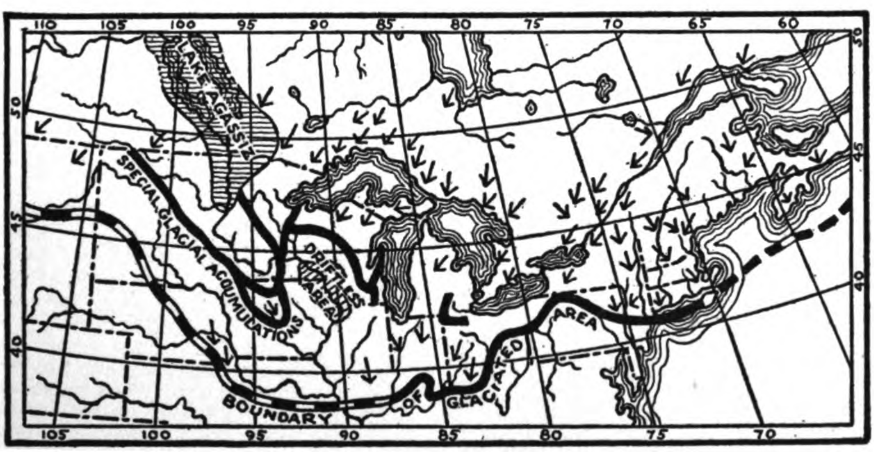


FIG. 358. Showing the area affected by, and the line of farthest advance of, the great glacier that once covered much of North America. The arrows show the course of its advance. Where the boundary line is solid black, the southern limit of the ice advance has been definitely located; where it is broken, white and black, this has only been estimated. Lake Agassiz was formed as the glacier melted, but of this prehistoric inland sea nothing remains but its bed, which scientists have mapped out by studying the soil formation and topography of the region, and a small remnant now known as Lake Winnipeg.

D. ARITHMETIC

By S. E. Rasor, *Professor of Mathematics in the Ohio State University. He was born on a large farm in Montgomery County, Ohio, where he became well acquainted with the practical side of farm life in carrying his share of the duties and chores associated with dairying, tobacco growing and other general farm activities. Later he took up teaching, first in district and township high schools, later in colleges and in the University with which he is now connected. Meanwhile he has never lost contact with the farm, having owned, managed or lived on a farm for most of his life, and being at present interested "in reclaiming some apparently worthless Ohio land."*

It may surprise some readers to note the simple, primary-grade principles with which this chapter opens. However, in treating a subject that is at the root of so many every-day farm problems, one that is made up of so many steps—each a development or an application of earlier ones—it has seemed both necessary and desirable to begin at the very beginning and to advance very slowly and carefully. On the other hand there are certain branches of higher mathematics, which, though valuable in certain lines of farm work (such as surveying, irrigation, etc.), are really materials only for the scientist and trained professional expert, and which are not discussed here. As far as the farmer is concerned, this chapter covers about every needed rule and principle, together with explanations and illustrations to tie it up with the sort of problems he has to face day by day. The general arithmetical operations cover pages 410 to 417; practical rules and measures used on the farm cover pages 418 to 423; the remaining pages are given up to tables of weights, measures, and equivalents.—Editor.

EVERYONE should be interested in what the world is doing, in our own country and its products. We should all know *definitely* about our farms, our mines, our forests, our great industries, and certainly about the accounts we should keep. Much of interest about these matters is found in Arithmetic.

When we look at our fingers we see why we count, as we do, by tens. Thus, eleven means ten plus one and is written 11; twenty-three means two tens and three more and is written 23; and so on.

First Principles

Fundamental Operations

To read large numbers, divide them into groups of three, starting at the right. As thus divided 21,685,476,983 *is read* 21 *billions*, 685 *millions*, 476 *thousands*, 983.

Numbers larger than billions are rarely used—perhaps only in astronomy, the distances to the fixed stars being so expressible in miles. However, for these inconceivable distances the mile is too small a unit. The distance to the sun is *eight minutes*, that is, it takes light eight minutes to travel from the sun to the earth, notwithstanding that light travels 7½ times around the earth in a second. With this as a basis, the distance to the nearest fixed star is 2½ years. To visualize our 1917 war debt of 20 billions of dollars, consider a string of 20 billions of dollar bills each 7½ inches long and laid end to end. Such a string would reach 95 times around the earth. By thus increasing the size of the unit on our measuring stick, we are oftentimes better enabled to visualize large numbers. So, too, in the humdrum of everyday duties, life oftentimes means more to us if we try to command a larger view of our surroundings. It is for this purpose of getting a better view of how things are related that we study numbers.

Addition of numbers is the process of finding a number that equals two or more other numbers. The result of adding them is called the *sum*. Only like numbers can be added.

For example, $3 plus $5 equals $8, and is written $3+$5=$8. But 3 eggs+5 turnips is neither eggs nor turnips.

To *check* or *prove* your work add the columns again in the opposite direction.

In adding a series of columns the results of adding each column are often put down separately, each in its own place, and these results then added. *For example:*

```
 231
 426
 728
 496
 ---
  21
 16
17
----
1881
```

In this case, the result of adding the first column (from the right) is 21, the second column gives 16, and the third, 17. These results then added give the final result. This is a safe plan for those unaccustomed to adding. It saves carrying to the next column and aids in correcting mistakes.

To subtract one number **from another** is to find the *difference* between them. Thus 48 subtracted from 75 is 27 and is written 75−48 = 27.

There are several common methods of subtracting. That method learned in the earlier

grades should be followed. The business man says: "*Deduct* the amount and remit the *balance*," instead of "*Subtract* the amount and remit the *remainder*."

Making change. If you owe 72 cents and give the merchant \$1, he says, as he lays down 3 cents: "72 and 3 are 75 and 25 makes a dollar." He thus sees that $\$1-\$.72=\$.28$ in which 72 cents is written \$.72.

Multiplication. If 7 is taken 4 times, that is, $7+7+7+7$, the result is 28 and is called the *product* of 4 times 7, and written $4\times7=28$. It is shortened addition. It is well to learn a table of all possible products of numbers between 2 and 12, and the number of combinations each can result from. as follows:

4	6	8	9	10	12^{2}	14	15
16^{2}	18^{2}	20^{2}	21	22	24^{3}	25	27
28	30^{2}	32	35	36^{3}	40^{2}	42	44
45	48^{2}	49	50	54	55	56	60^{2}
63	64	66	70	72^{2}	77	80	81
84	88	90	96	100	108	110	120
121	132	144					

For example, $3\times3=9$, $3\times4=12$, $6\times7=42$, $2\times5=10$, $2\times6=12$, $4\times11=44$, etc.

To multiply any number by 5, multiply by 10 and divide by 2.

For example, $168\times5=\frac{1680}{2}=840$.

To multiply by 25, multiply by 100 and divide by 4.

For example, $168\times25=\frac{16800}{4}=4200$.

To multiply by $6\frac{1}{4}$, multiply by 100 and divide by 16.

To multiply by $8\frac{1}{3}$, multiply by 100 and divide by 12.

To multiply by $12\frac{1}{2}$, multiply by 100 and divide by 8.

To multiply by $16\frac{2}{3}$, multiply by 100 and divide by 6.

To multiply by $33\frac{1}{3}$, multiply by 100 and divide by 3.

In dividing, for example, 99 by 7 which equals 14 with a *remainder* of 1 still to be divided, the result is written $99\div7=14^1/_7$.

To check the result, in the example just given, 14 is multiplied by 7 and the remainder 1 is added, giving 99.

Fractions

COMMON FRACTIONS. If an apple is divided into 4 equal parts, one part is called a fourth, three parts are called three fourths, etc. These are written $\frac{1}{4}$, $\frac{3}{4}$, etc. Thus the number into which the unit is divided, 4 here, is called the *denominator*, while the number of parts taken is called the *numerator* of the fraction and is written *above* the denominator with a short line between them.

To add fractions, the denominators must be alike. To make them alike we have merely to change the form of the fraction, for example $\frac{1}{2}=\frac{2}{4}$, $\frac{3}{7}=\frac{9}{21}$, by multiplying both numerator and denominator by the same number.

Example: $\frac{1}{2}+\frac{2}{3}=?$

Here the least number into which we can divide 2 and 3 is 6. Therefore 6 is to be the denominator for the changed fractions. Thus 1/2 = 3/6 and 2/3 = 4/6 and hence 3 sixths plus 4 sixths is equal to 7 sixths. This is written:

$$\frac{3}{6}+\frac{4}{6}=\frac{7}{6}=1\frac{1}{6}$$

Example: $\frac{1}{3}+\frac{2}{5}+\frac{5}{6}=?$

Here the least number we can use for new denominator is 30.

Then $\frac{1}{3}=\frac{10}{30}$, $\frac{2}{5}=\frac{12}{30}$, $\frac{5}{6}=\frac{25}{30}$.

Therefore $\frac{10}{30}+\frac{12}{30}+\frac{25}{30}=\frac{47}{30}=1\frac{17}{30}$

To subtract fractions, proceed as in addition except that the numerators are subtracted.

Example: $\frac{1}{2}-\frac{5}{12}=?$ *The least denominator permissible here is 12. Thus* $\frac{1}{2}=\frac{6}{12}$ *and then* $\frac{6}{12}-\frac{5}{12}=\frac{1}{12}$ *the required result.*

Example: $\frac{3}{4}-\frac{1}{3}=?$ *Here 12 is again the least denominator that contains both 3 and 4. Therefore,*

$$\frac{3}{4}=\frac{9}{12},\ \frac{1}{3}=\frac{4}{12},\ \text{and}\ \frac{9}{12}-\frac{4}{12}=\frac{5}{12}$$

To multiply fractions, multiply all the numerators together for a new numerator, and all the denominators together for a new denominator.

Example: Three fourths of (or times) eight ninths is written

$\frac{3}{4}\times\frac{8}{9}=\frac{3\times8}{4\times9}=\frac{24}{36}=\frac{2}{3}$. *Here as at other times we may often* cancel *to advantage.*

Thus, $\frac{3}{4}\times\frac{8}{9}=\frac{\cancel{3}\times\overset{2}{\cancel{8}}}{\cancel{4}\times\underset{3}{\cancel{9}}}=\frac{2}{3}.$

Example:

$$\frac{5}{6}\times\frac{12}{35}\times\frac{14}{15}=\frac{\cancel{5}\times\overset{2}{\cancel{12}}\times\overset{2}{\cancel{14}}}{\cancel{6}\times\underset{7}{\cancel{35}}\times15}=\frac{2\times2}{15}=\frac{4}{15}$$

To multiply mixed numbers, reduce each to the fractional form and multiply.

Examples: $5\frac{2}{5}\times 3\frac{3}{4} = \frac{27}{\cancel{5}}\times\frac{\cancel{15}^{3}}{4} = \frac{81}{4} = 20\frac{1}{4}.$

$\frac{1}{15}\times 45\frac{1}{2}\times 33\frac{1}{3}\times 16\frac{7}{8} = ?$

Here $45\frac{1}{2} = \frac{91}{2}$, $33\frac{1}{3} = \frac{100}{3}$ *and* $16\frac{7}{8} = \frac{135}{8}$.

The work may be arranged as follows:

$$\frac{1}{\cancel{15}}\times\frac{91}{2}\times\frac{\cancel{100}^{25}}{\cancel{3}}\times\frac{\cancel{135}^{\cancel{27}^{3}}}{\cancel{8}_{2}} = \frac{91\times 25\times 3}{4} = \frac{6825}{4}$$

$= 1706\frac{1}{4}.$

To divide by a fraction invert the one by which we are dividing and then multiply.

Example: $\frac{5}{8}\div\frac{3}{4} = \frac{5}{\cancel{8}_{2}}\times\frac{\cancel{4}}{3} = \frac{5}{6}$

$4\frac{1}{3}\div 2\frac{3}{5} = \frac{13}{3}\div\frac{13}{5} = \frac{\cancel{13}}{3}\times\frac{5}{\cancel{13}} = \frac{5}{3} = 1\frac{2}{3}.$

DECIMAL FRACTIONS. *A decimal fraction,* usually called a *decimal,* is merely an ordinary fraction whose denominator is a multiple of 10.

For example: $4\frac{7}{10}$ *may be written* 4.7; $\frac{125}{1000}$ *is written* .125.

The *decimal point* is the period placed to the right of the *units* and to the left of the *tenths* place. Thus .7 means $\frac{7}{10}$, .26 means $\frac{26}{100}$, $45.263 = 45\frac{263}{1000}$. The latter is read forty-five *and* two hundred sixty-three thousandths.

The comparison of decimal and common fractions is seen in writing checks. Thus a check for $3.25 is so written at one place on the check and at another it is usually written "Three and 25/100.... Dollars."

Decimals are added or subtracted just as whole numbers, keeping the decimal points under one another. Thus 1.09 + .251 is written

$$\begin{array}{r} 1.09 \\ .251 \\ \hline 1.341 \end{array}$$

and added in the usual way.

To multiply decimals, proceed as with ordinary numbers and preserve in the product as many decimal places as there are in *both* of the numbers multiplied. Thus, 6.2 × .31 = 1.922.

In dividing decimals, therefore, the number of decimal places in the answer is equal to the *difference* of the number of decimal places in the given numbers. Thus, 1.922 ÷ 6.2 = .31.

COMPOUND NUMBERS. A number composed of different kinds of units that are related to each other is called a "compound number"; as 2 bu. 3 pk. 1 qt. Here quarts, pecks, bushels are related to each other, since 4 pk. = 1 bu., and 8 qt. = 1 pk. This number then reduces to 11 pk. 1 qt. and this to 88 qt. + 1 qt. = 89 qt.

Various kinds of measures are necessary in modern life. Some of these are given on page 423 of this Chapter.

Addition and subtraction of compound numbers:

Example: Find the sum of 7 hr. 32 min., 12 hr. 24 min., 20 hr. 13 min.

hr.	min.	
7	32	The sum of the min. = 69 min., but this = 1 hr. 9 min. Write the 9
12	24	min. under the min. column and
20	13	add the 1 hr. to the hr. column, etc.
40	9	

40 hr. 9 min. = 1 da. 16 hr. 9 min. *Ans.*

Example: From 36 gal. 2 qt. 1 pt. take 19 gal. 3 qt. 2 pt.

gal.	*qt.*	*pt.*	
			As 2 pt. cannot be taken from 1 pt.,
36	*2*	*1*	*a qt. or 2 pt. is borrowed from the*
19	*3*	*2*	*qt. column and added to the pt. column. Thus 2 pt. from 3 pt. = 1 pt.*
16	*2*	*1*	*Continue in the same way for the other columns.*

16 gal. 2 qt. 1 pt. Ans.

Difference between dates.

Example: Find the time from July 4, 1856, to Jan. 1, 1917.

yr.	*mo.*	*da.*	
			It is customary to consider
1917	*1*	*1*	*30 days to the month in esti-*
1856	*7*	*4*	*mating time. July is the 7th month and Jan. is the 1st*
60	*5*	*27*	*month.*

60 yr. 5 mo. 27 da. Ans.

Percentage

Per cent. *Per cent,* often written %, means *hundredths.* Thus 6% of anything means .06 of it. However, the common fraction form is often advantageous.

1%	*= .01*	*= $\frac{1}{100}$*	*$8\frac{1}{3}$%*	*= .083+*	*= $\frac{1}{12}$*
10%	*= .10*	*= $\frac{1}{10}$*	*$16\frac{2}{3}$%*	*= .166+*	*= $\frac{1}{6}$*
$12\frac{1}{2}$%	*= .125*	*= $\frac{1}{8}$*	*$33\frac{1}{3}$%*	*= .333+*	*= $\frac{1}{3}$*
20%	*= .20*	*= $\frac{1}{5}$*	*$37\frac{1}{2}$%*	*= .375*	*= $\frac{3}{8}$*
25%	*= .25*	*= $\frac{1}{4}$*	*$62\frac{1}{2}$%*	*= .625*	*= $\frac{5}{8}$*

To find a certain per cent of a number, as 6% of $250, we take .06 of $250 as in decimals, giving $250 × .06 = $15.00.

Example: How much butter fat in 48 lbs. of 3.2% milk and what is it worth when butter is selling at 50¢ per lb., estimating by the usual rule that 1 lb. butter fat = $116\frac{2}{3}$% of its weight in butter?

48 lb. × .032 = 1.536 lb. butter fat.
1.536 lb. × $1\frac{1}{6}$ = 1.792 lb. butter.
1.792 lb. butter @ 50¢ = $.896 = 90¢.

Example: A poultry meal contains 22.9% protein, 5.27% fat and 5.41% fiber. Find the amount of each in 400 lb.

400 lb. × .229 = 91.6 lb. protein,
400 lb. × .0527 = 21.08 lb. fat,
400 lb. × .0541 = 21.64 lb. fiber.

To find that number of which a certain per cent is given.

Example: How many pounds of 3.5% milk must a cow give to produce 5 gallons—about 42 lb. of cream?

Here, .035 of the required amount = 42 lb., then the required amount = 42 lb. ÷ .035 = 1200 lb.

To find what per cent one quantity is of another.

Example: 8 is what per cent of 40?
8 is ⅕ of 40, that is, it is .20 or 20% of 40.

Example: What is the % gain when a farmer gains $25 on a horse that cost him $120?

$25 is $\frac{25}{120}$ *or .21, that is, 21% of $120.*

Example: What is the per cent depreciation on a harvester that cost $140 and was sold after one year for $75?

The depreciation was $140 − $75 = $65.

$65 is $\frac{65}{140}$ *or* $.46\frac{3}{7}$*, that is,* $46\frac{3}{7}$ *% of its cost.*

Interest

Interest is money that is paid for the use of other money called the *principal*. Interest at 6 per cent means 6% or .06 of the principal for one year regarded usually as 12 months of 30 days each.

Example: What is the interest on $241.50 for 3 yr. 4 mo.?

```
$241.50
     .06
$14.4900 interest for 1 yr.
      3⅓
  43.47
   4.83
$48.30 interest for 3⅓ yr.
```

Example: Find the interest on $375 from September 10, 1907, to Aug. 7, 1910, at 6%.

```
Time to run: 1910— 8— 7
             1907— 9—10
       2 yr.—10 mo.—27 da.
      $375
       .06
    $22.50 interest for 1 yr.
         2
    $45.00 interest for 2 yr.
10 mo. = 10/12 of 1 yr.
    $18.75 interest for 10 mo.
27 da. = 9/100 of 10 mo.
    $ 1.6875 interest for 27 da.
    $65.4375
```

Total interest therefore is $65.44.

Borrowing from a Bank

Borrowing from a bank. *To borrow money from a bank* is exactly the same as borrowing from an individual *except* that at a bank *the time is usually for short periods* and *the interest is paid in advance.*

The following is the usual form of *promissory note.* It must always contain the words "For Value Received":

```
$________        New York,__________191___
_______________________after date___promise to pay to
the order of_________________________________________
_____________________________________________Dollars
at___________________________________________________
For value received
No._______Due_______            _____________________
```

In this note no interest is mentioned, since at a bank the interest is paid in advance. On the above note Henry Smith would obtain $150 less the interest for 60 days which is $150 − $1.50 = $148.50. Discounting a note in this way is called *Bank Discount.*

Square Root

One of two equal factors of a number is called the *square root* of the number. Thus since 4 times 4 = 16, 4 is called the square root of 16. It is written $\sqrt{16} = 4$, and is read, the square root of 16 equals 4.

Example: what is the side of a square field which contains four acres?

Since 4 acres = 640 sq. rods we must extract the square root of 640 as follows:

```
     6̇4̇0.0̇0̇|25.3
     4
    ___
 45 |240
    |225
    ____
503 | 1500
    | 1509
    ____
```

Point off the number into periods of two figures each, whole numbers to the left, decimals to the right, placing dots as shown. Find the greatest square in the left hand period and place its root to the right. This is 2 in the example. Subtract this square from the period and bring down the next period. Next, double the root *found. This gives 4 which is set down to the left of 240 the new remainder. As a trial division 4 divides into 24 about 5 times since on trial 6 would be too large. This 5 is now* annexed *to the 4 giving 45 to the left of 240 as shown. It is also annexed to the 2 in the root. Now multiply 5 times 45 and subtract it from 240. Again, bring down the next period. Then double the root found, viz., 25, giving 50, which is written to the left of the remainder as before. The trial division of 50 into 150 gives 3 as the next figure of the root. Thus a field 25.3 rods each way contains 4 acres.*

Example: Extract the square root of 1467.85.

$$\begin{array}{r|l} & 1\dot{4}6\dot{7}.8\dot{5}\,|\,38.3 \\ & 9 \\ \hline 68 & 567 \\ & 544 \\ \hline 763 & 2385 \\ & 2289 \\ \hline & 96 \end{array}$$

AVERAGES. The *average* of two quantities of the same weighted value is one half of their sum.

A board is 6 in. wide at one end and 10 in. at the other end. Its average width is thus ½ of 6+10; that is, 8 in. Again, the average temperature of 10 gal. of water at 32° and 4 gal. at 60° is

$10 \times 32°$ plus $4 \times 60°$ divided by $10 + 4$ gal; that is $\frac{320+240}{14} = 40°$.

If a farmer has 10 bushels of corn with ears 6 in. long. and 5 bushels with ears 10 in. long, the *average length of ear* is

$$\frac{10 \times 6 + 5 \times 10}{10 + 5} = \frac{60 + 50}{15} = 7\tfrac{1}{3} \text{ in.}$$

Example: A farmer has a Jersey cow that gives daily 5 gal. of 5% milk and two Holstein cows that give 14 gal. of 3% milk. What is the per cent of butter fat of their mixture?

$$\frac{5 \times .05 \text{ plus } 14 \times .03}{5+14} = \frac{.25 + .42}{19} = \frac{.67}{19} = .035;$$

that is, the mixture is a 3.5% milk.

Example: In a civil-service examination a candidate makes a grade of 70% in arithmetic which is to count 5 points, 80% in penmanship which is to count 1 point, 90% in geography which carries a weighted value of 2 points. What is the final grade?

$$\frac{5 \times 70\% + 1 \times 80\% + 2 \times 90\%}{5 + 1 + 2} = 76\tfrac{1}{4}\%, \textit{ the}$$

final grade.

Mensuration or Measuring

THE CIRCLE. A *circle* is a plane figure bounded by a curved line called the *circumference*, every point of which is equidistant from a point within called *the center*. A line through the center terminating at both ends on the circumference is the *diameter*. The line from the center to the circumference is the *radius*. Any portion of the circumference is an *arc*.

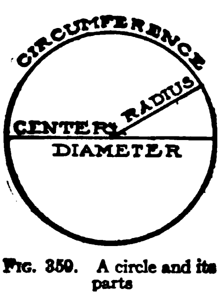


FIG. 359. A circle and its parts

The circumference of any circle is always 3.1416, approximately 3 1/7 times the diameter. The symbol usually used for this constant is the Greek letter π (*pi*).

Thus, *Circumference* = π *Diameter*.

The area of a circle is π times the square of the radius; or is equal to one half of the circumference times the radius;

that is, Area of circle* = π *square of radius,

=1/2 circumference times radius.

Example: Find the circumference and the area of a circle whose radius is 8 in.

Circum. $= 2\,\pi\,8 = 16 \times 3.1416 = 50.3$ *in.*

Area $= \tfrac{1}{2}\,(50.3 \times 8) = 201.2$ *sq. in.*

ANGLES. Angles are used to measure (in degrees) a turning movement and also to measure a difference in direction. A circle contains 360°. This is a complete turn. A quarter turn, called a right angle, thus contains 90°. When two lines form a right angle they are perpendicular to each other.

In a practical way, angles are measured on a drawing by a semi-circular scale called a *protractor*. In the field, a surveyor's transit is usually used.

A TRIANGLE is a plane figure bounded by 3 straight lines. When the sides are equal

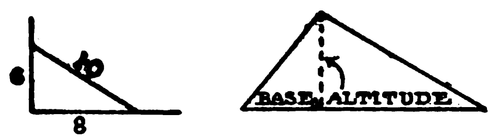


FIG. 360. The parts of a triangle and (*left*) the ratio between the length of the sides of a right triangle

in length, the angles are also equal and the triangle is called *equilateral*. If 2 sides are equal 2 angles are equal, and it is called *isosceles*. When one of the angles of a triangle is a right angle, it is a *right triangle*. In this case, the side opposite the right angle is called the *hypotenuse* and the other two sides are called the *legs*.

In a right triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides or legs.

A farmer conveniently squares a building by measuring from a corner 6 ft. along one side and 8 ft. along the other side. A 10 ft. pole then just fits the ends of these measurements when the corner is square, since

$$6^2 + 8^2 = 10^2 \text{ i.e. } 36 + 64 = 100.$$

The altitude of a triangle is the perpendicular distance from any corner to the opposite side.

The area of a triangle is equal to the base times one half the altitude.

If the three sides are given, the area is found as follows: Add the three sides together and take one-half of the sum: from this half sum subtract each side separately.

Science tells us what feeding does and how, normally, we should do it. But the animal given free rein is the best judge of all of what it wants and needs

Exercise is as much a need of the body as food or water; the more active the animal, the more exercise it needs. This is an ideal poultry range

The Most Successful Farmer is He Who Combines All That Science, His Own Practical Experience, and the Work of Other Farmers Have Taught Him, and Then Makes Rules and Develops Methods to Fit His Own Needs

This is obviously good wheat land. The wise farmer in working it will choose his rotations and methods with that fact ever in mind

How did the farmer who planted this orchard know that apples were *the* crop for this soil and location? This is the kind of problem that makes farming the complex, difficult business it is

As Certain Soils are Best for Certain Crops so Certain Sections of the Country are Best for Certain farmers. The Thing is to Find YOUR Place and Then Stay There

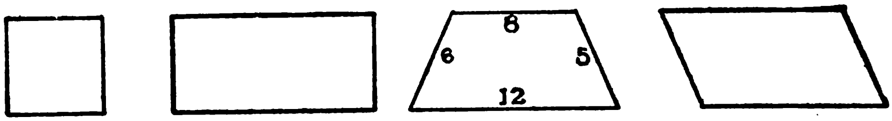


FIG. 361. Quadrilaterals, from left to right: square, rectangle, trapezoid, parallelogram.

Now multiply the three remainders and the half sum together and extract the square root of the product. This gives the area.

Example: A farmer has a triangular field whose sides are found to be 10, 12 and 14 rd. What is its area?

$\frac{10 + 12 + 14}{2} = 18.$ *This is the half sum.*

$18-10=8$

$18-12=6$

$18-14=4$ *These are the three remainders.*

Then $18 \times 8 \times 6 \times 4 = 3{,}456$. *The square root of this is 59 (nearly) square rods, the area.*

QUADRILATERALS are any four-sided plane figures. When the sides are all equal and the angles right angles it is called a *square*. In a *rectangle* the angles are all right and the opposite sides equal. If only 2 sides are parallel it is a *trapezoid*, while in a *parallelogram* the opposite sides are *parallel* and *equal* whatever the angles may be. (Fig. 361.)

A five-sided figure is called a *pentagon*. A six-sided one is a *hexagon*.

The area of a square, or a rectangle, or a parallelogram is equal to the base times the altitude (the distance between parallel sides).

The area of a trapezoid is the altitude times one half the sum of the parallel sides.

Example: The parallel sides of a field in the form of a trapezoid measure 8 rd. and 12 rd. Find the area if the altitude is 7 rd.

$\frac{8 + 12}{2} = 10$. *This times the alt. is* $10 \times 7 =$ *70 sq. rd., the area.*

The area of irregular-shaped fields may be found by dividing them into triangles, rectangles, trapezoids, etc. and taking the sum of the areas of each of these divisions.

Example: A farmer has an irregular field between a road and the river. Find its area by measuring the lengths of the sides and the lengths of the diagonals connecting opposite corners as shown in Figure 362.

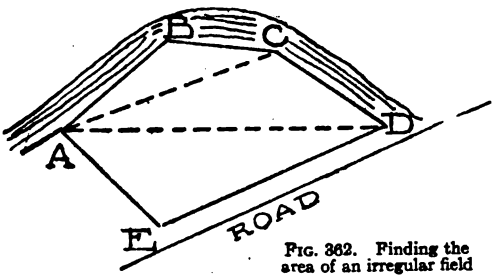


FIG. 362. Finding the area of an irregular field

The distances measured in straight lines are:

AB	*=30 rods*	*AC*	*=45 rods*
BC	*=21 "*	*AD*	*=60 "*
CD	*=24 "*		
AE	*=27 "*		
ED	*=54 "*		

The area is thus the area of the triangles ABC, ACD, ADE, whose sides are known.

Ans. 1472 sq. rd. This divided by 160 sq. rd. in an acre = 9 1/5 acres.

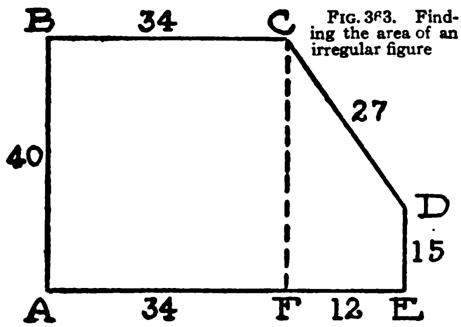


FIG. 363. Finding the area of an irregular figure

Example: Find the area of the field as shown in Figure 363, above, the measurements being in rods.

ABCF is a rectangle whose area is 34 rd. $\times$ *40 rd. = 1360 sq. rd.*

CDEF is a trapezoid whose altitude is 12 rd. and the parallel sides 40 rd. and 15 rd. Its area is therefore

$$\left(\frac{40 + 15}{2}\right) \times 12 = 330 \text{ sq. rd.}$$

The total area of the field is therefore 1360 sq. rd. + 330 sq. rd. = 1690 sq. rd. = 10 A. 90 sq. rd. = 10 9/16 acres.

The volume of a prism of rectangular shape is found by multiplying the area of one end by the length, using the same unit in all measurements.

The volume of a cube is equal to the cube of an edge.

The volume of a cylindrical solid is equal to the area of the base times the height.

The volume of a pyramid or of a cone is equal to the area of the base times one third

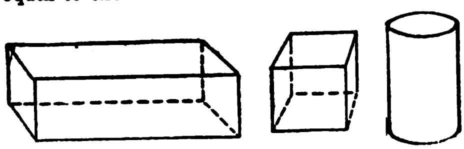


FIG. 364. Solids, from left to right: prism, cube, cylinder

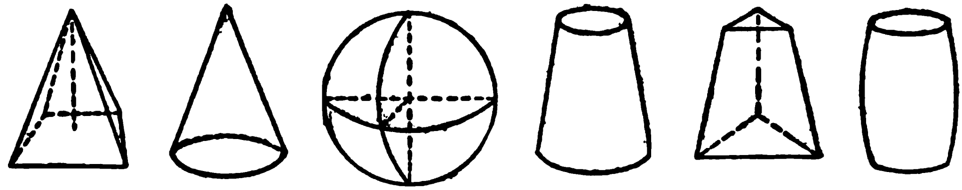


FIG. 365. Solids, from left to right: pyramid, cone, sphere, frustum of cone, frustum of pyramid, barrel

of the altitude, the altitude being the perpendicular distance from the base to the highest point.

The volume of a frustum of a pyramid or of a cone is found as follows: Add together the areas of the upper base, the lower base, and the square root of their product. Multiply this sum by one third of the distance between the bases.

The lateral surface of a pyramid or of a cone is equal to the distance around the base times one-half of the slant height.

The volume of a sphere is equal to 4/3 times π (3 1/7, nearly) times the cube of the radius, i.e.

$$V = \frac{4}{3}\pi R^3.$$

The surface of a sphere is equal to 4 π times the square of the radius.

The volume of a barrel may be estimated roughly by regarding it as a cylinder with the same height as the barrel, but with a diameter equal to half the sum of head and bung diameters.

Examples: 1. A bucket is 12 in. deep with upper diameter 10 in. and lower diameter 8 in. Find its volume in gallons.

It is a frustum of a cone.

$\pi\,5^2 = 25\,\pi$, *area of upper base.*

$\pi\,4^2 = 16\,\pi$, " " *lower* "

$\sqrt{25\,\pi\;16\pi} = 20\,\pi$, *the square root of their product. Therefore the volume is* $(25\,\pi + 16\,\pi + 20\,\pi)$ *times one third of 12, the altitude. This gives*

$61\,\pi \times 4 = 244\,\pi = (244)\,(3\tfrac{1}{7}) = 767$ *cu. in.*

Since there are 231 cu. in. in a gallon, 767 cu. in. = 3.32 gal. = 3 1/3 gal. nearly.

2. A conical pile of sand measures 8 ft. in diameter at the base and is 3 ft. high. Find the number of "yards" (27 cu. ft.) in it.

$4^2\pi = (16)\,(3\tfrac{1}{7}) = 50.3$ *sq. ft. the area of the base.*
(50.3) *times 1/3 of 3 = 50.3 cu. ft. = 1.9 cu. yds. nearly.*

Similar figures are those that have the same shape.

The areas of similar figures are to each other as the *squares* of any corresponding dimensions; the volumes of similar solids are to each other as the *cubes* of corresponding dimensions.

Example: A farmer has two strings of drain tile, of diameters 3 in. and 4 in. What size tile shall he use to combine them into one drain?

They are related to each other as the squares of their diameters, i.e. $3^2 + 4^2 = 25$. *This is the square of the diameter of the tile which is equal to the other two, that is, its diameter = 5 in.*

Example: How do two oranges, diameters 2 in. and 3 in. compare in volume?

Their diameters are to each other as 2 to 3; therefore their volumes are to each other as 2^3 *to* 3^3, *that is, as 8 to 27.*

Rules and Measures

Practical Measurements

1. Estimating the height of a tree is perhaps easiest done by measuring the length of the shadow of a vertical pole and the length of the shadow of the tree. In figure 366, ED is the tree, AD its shadow, CB the pole, and AB its shadow. Hence

$$\frac{\text{height of tree}}{\text{shadow of tree}} = \frac{\text{length of pole}}{\text{shadow of pole}}$$

i.e. $DE = \dfrac{AD \times BC}{AB}$

Example: What is the height of a tree if its

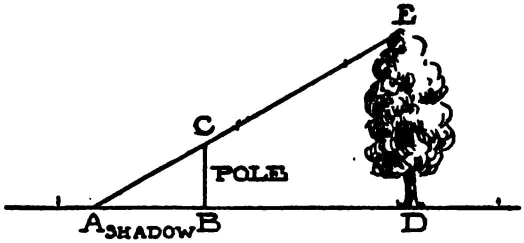


FIG. 366. Estimating the height of a tree; method 1

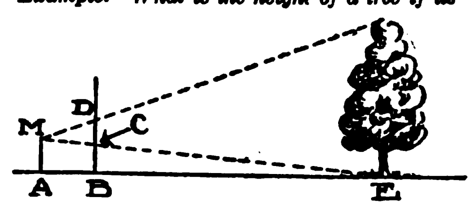


FIG. 367. Estimating the height of a tree; method 2. See p. 419

shadow is 66 ft. at the same time that a ten-foot vertical pole casts a shadow 8 1/2 ft. long?

$$DE\ (\textit{height of the tree}) = \frac{10 \times 66}{8\ 1/2} = \frac{660}{8\ 1/2} = 78\ \textit{ft.}$$

2. Finding height of a tree by sighting. A man stands at A (Fig. 367) and sights along a vertical pole BD to the top and to the bottom of the tree: at the same time having an assistant mark the line of sights on the pole at C and at D. The distances CD, CM, ME are then measured. For practical purposes the distance ME may be taken equal to AE on the ground. Then

$$\text{height of tree} = \frac{CD \times AE}{MC}$$

3. Distance across a swamp, both sides accessible. (Fig. 368.) Lay off AC = CE in a straight line and through C take BC = CD in a straight line. Then measure DE. This is equal to the required distance AB.

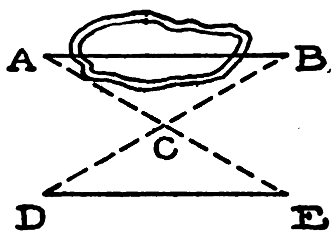


FIG. 368. Estimating the distance across a swamp

4. Distance across a river or a swamp may be estimated by use of a vertical staff AE (Fig. 369) to which is attached, at right angles, a movable arm CD. The observer raises DC so that C falls in the line of sight EB. Now by simply revolving the arm DC around the staff he locates B′. Then AB′ which = AB, is measured and is the distance required.

This method just given may be carried out by a man standing at A with his eyes at E. He now raises or lowers his head till the edge of his hat brim at C falls in the line of sight to the object at B. Then, without raising or lowering the head, he turns about and observes the point B′ where the line of sight strikes the ground. The distance AB′, = AB as above, is the distance required.

5. Distance of visibility on a level plain. If one climbs a tree, he can see farther on a plain than when on the ground. The distance one can see is given as follows:

Multiply the height in feet by 3/2 and extract the square root. *This is the distance in miles.*

Example: How far can a man see on a level plain from the top of a tree 54 ft. high? If 150 ft. high, how far can he see?

$54 \times \frac{3}{2} = 81$. *The square root of this is 9. Hence he can see 9 miles.*

Also $150 \times \frac{3}{2} = 225$. *The square root of this is 15 miles.*

LUMBER MEASURE. A board 1 ft. square and 1 in. thick, called a board foot, is the unit in measuring lumber. In practice a board 1 ft. square and 3/4 or 7/8 in. thick also is called a board foot. Dealers usually speak of board feet as feet. In practice, 2 ft. 6 in. is usually written 2′ 6″. Lumber is usually sold at so much "per M," that is, per 1,000 ft. B.M. (board measure).

In billing 5 pieces 2″ by 4″ and 14′ long the form is 5 pc. 2″ × 4″ × 14′.

This would be read "5 two-by-four 14 ft."

To find the number of board feet in a piece of lumber, *multiply the length in feet by the width and the thickness in inches and divide by* 12.

Thus, 15 pc. 2″ × 4″ × 18′ will contain

$$\frac{15 \times 18 \times 2 \times 4}{12} = 180 \text{ feet.}$$

At $3.00 per hundred, or 3c per foot, this would cost $5.40.

To estimate lumber in the log, Doyle's rule, widely used, is as follows: *Subtract 4″ from the smallest diameter in inches; take 1/4 of this remainder and square it; then multiply by the length of the log in feet.*

Example: How many feet of lumber in a log 26 ins. in diameter and 18 ft. long?

$26'' - 4'' = 22''$. *One-fourth of* $22 = \frac{11}{2}$.

$\frac{11}{2} \times \frac{11}{2} \times .18 = 545$ *ft. nearly.*

To find the side of the largest squared piece of timber *that can be cut from a given log.*

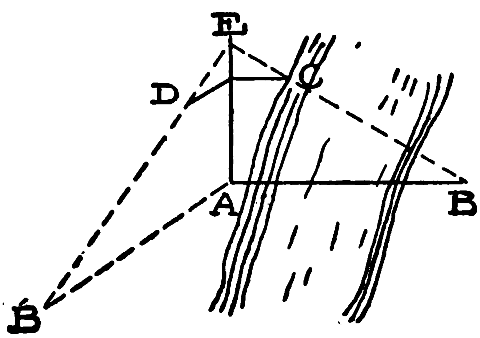


FIG. 369. Estimating the distance across a river

(1) When the diameter of the log is known, the side of the largest squared piece obtainable from it is equal to 7/10 of the diameter. For example, if the log is 16″ in diameter, the side of the largest squared piece is 16 × 7/10 = 11″.

(2) When the circumference only is available, divide the circumference by 3 1/7 and

multiply the result by 7/10. For example, a log whose circumference is 62″ yields a squared piece whose side is

$$62 \div 3\frac{1}{7} \times \frac{7}{10} = 62 \times \frac{7}{22} \times \frac{7}{10} = 13.8''.$$

ESTIMATING WOOD AND COAL. Cordwood is 4 ft. long. A pile 8′ × 4′ × 4′ is called *a cord of wood. A rick* of stove wood is usually 8′ long and 4′ high and of any length suitable for a stove.

To find the number of cords in a pile of cordwood multiply together its length and height in feet and divide by 32.

A ton of coal contains 25 bu. heaped (2,688 cu. in.) and measures 38 8/9 cu. ft. when mined. The number of cu. ft. per ton for coal in the mine is considerably less than after it is mined.

To find the number of bushels of coal in a bin or wagon bed, multiply the length by the depth by the width, all in inches, and divide by 2688.

LIQUID MEASURE. The liquid gallon contains 231 cu. in. This is exactly the contents of a box 3″ × 7″ × 11″ inside measurements. A cu. ft. contains 1728 cu. in. or 7 1/2 gallons of water.

To find the number of gallons of water in a well, cistern, or other container, find the cubical contents in inches and divide by 231. If the measurements are in feet, multiply the cubical contents by 7 1/2.

LAND MEASURE. In the western states land is marked out or surveyed in divisions of the form of squares or rectangles. The largest squares are laid out 24 mi. each way by north and south division lines called *meridians* and east and west lines called *base lines*. Each such 24-mi. tract is then divided into 16 squares called townships. The rows or tiers of townships lying north and south along the principal meridian are called *ranges*—the first tier west being called range No. 1 west

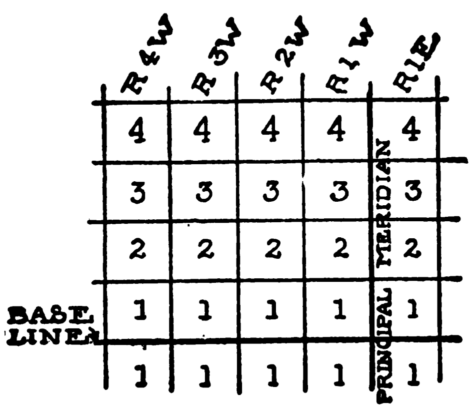


FIG. 370. A tract 24 miles square divided into 16 townships each 6 miles square according to the rectangular land survey system.

and written R1W. The townships are again subdivided into *sections*. Each section is a mile square and contains 640 acres. There may be some deviations from exactly 640 acres in a section, but these are added to or subtracted from certain half sections. This gives rise to certain fraction lines and fractional sections. (See Vol. III., p. 227, Fig. 333.)

Rules for measuring the area of square and rectangular and odd-shaped fields are given under "Mensuration" (p. 414).

PAPERING AND CARPETING. To estimate the number of rolls of paper for the walls of a room, multiply the distance around the room in feet by the height in feet and divide by 72 for double rolls; and by 36 for single rolls. Deduct a double roll for each three openings. Count a fractional roll as a whole roll.

It is necessary in carpeting a room to decide upon which way the strips are to run—lengthwise or crosswise. Allowance must be made for matching and for fractional strips since only whole strips can be bought. The width of carpets is from 3/4 yd. to a yard and that of matting 1 yard. Both are sold by the yard.

To estimate the number of yards of carpet for a room, determine the length of the strips, then the number of them. Add to the length of each strip the allowance for waste in matching. Find in this way the combined length of the strips in feet. This divided by 3 is the number of yards required.

Soil Problems

Fertilizers. Nitrogen, phosphoric acid, and potash are the commercial plant foods contained in the soil. Different crops take different amounts of them from the soil. They may be returned to the soil by means of commercial fertilizer, straw, and manures.

A complete fertilizer (one containing all the ingredients) is quite often unnecessary, since, for example, a crop of clover may supply all the nitrogen needed for the next crop.

Commercial fertilizers must be labeled. One labeled 3–8–4 for example means (*in most states*) that it contains 3% nitrogen, 8% phosphoric acid, 4% potash.

Drainage. A fall of 6 in. to 1 ft. for each 100 feet is considered a good grade for farm drainage. A fall of 2 to 3 in. for each 100 feet is for most cases considered a minimum grade.

The size of the tile to be used in a main will depend upon the fall, the area to be drained, and the water from laterals.

To determine the number of acres that a tile main of given size and grade will drain, multiply the discharge in cubic feet per second for a given size of tile on a grade of 1 ft. in a 100 ft. (Table I) by the square root of the grade in question from Table II, and this product by the proper constant. This con-

stant is 24 when water to the depth of 1 in. over the area is to be removed in 24 hours: it is 48 when 1/2 in. is to be so removed and 96 if 1/4 in. is to be so removed. For open soils the 1/4 in. standard is practical.

TABLE I

Diameter of tile in inches	Discharge in cu. ft. per sec. Grade 1 ft. in 100 ft.
4	0.16
6	0.49
8	1.11
10	2.05
12	3.40
15	6.29
20	13.85

TABLE II

Fall per 100 ft.		Square Root of Grade
In inches	In feet	
1	0.09	0.30
2	0.16	0.40
3	0.25	0.50
6	0.50	0.70
9	0.75	0.87
12	1.00	1.00

Example: How many acres will a 6-in. main drain when laid on a grade of 6 ins. per 100 ft., using the half-inch standard?
Let D *=discharge of the tile (Table I)*
R *=the square root of the grade (Table II)*
S *=the standard constant.*
A *=acres to be drained.*
Then $A = D \times R \times S$. *Substituting here the given data,*
$A = .49 \times .70 \times 48 = 16.46$ *acres = 16 to 17 acres. Answer.*

Example: What size main should be used to drain 40 acres on a grade of 6 ins. per 100 ft., using the half-inch standard?
Since $A = D \times R \times S$, *we have*
$40 = D \times .7 \times 48.$
Therefore D, the discharge = 1.19. From Table I this discharge corresponds to about that from an 8-in. tile.

For average rainfall, it is usually reckoned that:

Pipes of 3″ diam. will drain 6 acres in clay soils; 4 to 5 acres in free soils.

Pipes of 4″ diam. will drain 9 acres in clay soils; 6 to 7 acres in free soils.

Pipes of 6″ diam. will drain 25 acres in clay soils; 20 to 22 acres in free soils.

Crops in Bulk

CORN. A bushel of shelled corn = 2150.4 cu. in. *On the cob* 2 1/2 cu. ft., *and in the husk* 3 1/4 cu. ft. of corn make a bushel.

To find the number of bushels of corn in a crib, multiply the length, width, depth in feet together and divide by 3 1/4 for corn in the husk, and by 2 1/2 for corn on the cob.

For a round pile, square 1/2 the distance across the pile in feet, multiply by 3 1/7, then multiply by 1/2 the height of the pile in feet and divide by 3 1/4 for corn in the husk or by 2 1/2 for corn on the cob.

Example: How many bushels of ear corn in a wagon bed 10 ft. long, 3 ft. wide, 27 ins. or $2\frac{1}{4}$ ft. deep?

$$\frac{10\times 3\times 2\frac{1}{4}}{2\frac{1}{2}} = \frac{\overset{2}{\cancel{10}}\times 3\times 9\times \cancel{2}}{\underset{2}{\cancel{4}}\times \cancel{5}} = 27 \text{ bu.}$$

An approximate rule, much in vogue in many communities, is to take 3 heaping half bushels of corn on the cob as the equivalent of 1 bushel of corn.

HAY. A ton of packed timothy hay contains about 450 cu. ft.; a ton of clover, alfalfa, or cowpea hay, about 550 cu. ft.

To find the number of tons in a hay loft, multiply the length, width, depth in feet together and divide by 450 for timothy hay and by 550 for clover, alfalfa, or cowpea hay.

For a mow that is shallow and recently filled, 1/8 to 1/4 should be deducted from the results of the above rule.

The only exact method of measuring hay or grain is to weigh it. The above rules, however, give practical working results.

APPLES, POTATOES. Apples, potatoes, turnips, etc. are measured by the *heaped* bushel. As a working rule, 1 3/5 cu. ft. may be taken as a bushel. This is slightly large, as a heaped bushel varies from 2,688 cu. in. to 2,747 cu. in. as given by different authors, and 1 3/5 cu. ft. is 2,765 cu. in.

The number of bushels in a round pile of apples, potatoes, etc., is found as follows: Square 1/2 the distance across the pile in feet, multiply by 3 1/7, then by 1/2 the height of the pile in feet and then by 5/8.

Example: What is the depth of a round half bushel measure which measures 14 inches in diameter inside?

The area of the cross section of this measure is $\left(\frac{14}{2}\right)^2 \times 3\frac{1}{7} = 154$ sq. in. The number of cu. in. in a half bushel is equal to 1075.2. This divided by 154 (*i.e.* 1075.2 ÷ 154) = 7 inches deep.

A box 10 in. square and $10\frac{3}{4}$ inches deep (inside) also contains a half bushel.

Silo, Dairy, Stock, and Meat Problems

SILOS. The size of a silo must be in keeping with the number of cattle to be fed. The diameter of the silo must be of such size as to insure that the proper depth will be removed

daily. Silage of all kinds deteriorates unless it is fed *regularly, evenly, and at a rate of not less than 2 inches depth daily.* Removing 5 or 6 inches depth daily insures but little waste of feed. Experience has shown that the most satisfactory results are obtained by *providing in the silo a horizontal feeding surface of about 5 square feet for each cow.*

To insure proper settling of the silage, excluding in this way the bacteria that cause decay, *the height of the silo should seldom be less than 30 feet.*

On an average, 1 ton of silage occupies about 50 cu. ft. In a small silo, 1 ton will occupy 60 cu. ft. or perhaps more.

Thus *the diameter* of a silo is controlled largely by the *number of cattle to be fed,* while *the height* is gauged by the *quantity* to be fed.

One cubic foot of silage per head is a widely used daily ration.

Example: What should be the height of a round silo for a herd of 25 cows, if each one is to be fed 40 lbs. daily for 180 da.?

For 25 cows, $5 \times 25 = 125$ sq. ft. of horizontal feeding surface is required. This is the area of a circle. To find its diameter, divide 125 by .7854 and extract the square root of the result. This gives 12.6 ft. for the diameter of the silo.

But to feed 25 cows each 40 lbs. daily for 180 days requires

$$25 \times 180 \times 40 \text{ lbs.} = 18{,}000 \text{ lbs.} = 90 \text{ tons.}$$

Now 1 ton occupies 50 cu. ft., and 90 tons occupy 4,500 cu. ft. of space.

Therefore, the height of the silo is the capacity 4,500 cu. ft. divided by the cross-sectional area, 125 sq. ft., that is,

$$\frac{4500}{125} = 36 \text{ ft., the height.}$$

DAIRY PROBLEMS. One gallon of milk weighs about 8 1/2 lbs. Milk from different breeds of cows will vary in the butter-fat content from 2% to 6%. One pound of butter fat is usually regarded as the equivalent of 1 1/6 lbs. of butter.

Butter fat is not only the most constant element in milk, but it has the greatest marketable value. The butter-fat content of milk is thus the basis of standardized milk.

If a certain milk is too low in butter fat, it may be brought up to the standard by adding cream or milk of a higher per cent of butter fat. Skimmilk (*but not water*) may be used to lower the per cent of butter fat.

Example: A man has 10 gal. of 4.5% milk and 15 gal. of 2% milk. What is the per cent of milk obtained by mixing them?

This is merely a problem in averages (see the section on averages, p. 414).

$$\frac{10 \times .045 + 15 \times .02}{10 + 5} = \frac{.45 + .30}{25} = .03,$$
i.e. 3% milk.

Example: A man has 10 gals. of 4.5% milk. How many gallons of 3% milk shall he use to make 3.5% milk?

Let us use the formula for averaging 10 gal. of 4.5% milk and B gal. of 3% milk to get 3.5% milk. Thus

$$\frac{10 \times .045 + B \times .03}{10 + B} = .035, \text{ i.e. } 3.5\% \text{ milk;}$$

i.e. $10 \times .045 + .03\,B = (.035)\,(10 + B) = .35 + .035\,B$

$\therefore .45 - .35 = .005\,B$, *from which*
$.10 = .005\,B$, *i.e.* $B = 20$ *gallons, the amount.*

CATTLE, HOG, CALF, MEAT PROBLEMS. Calves at birth weigh about as follows:

Light-weight calves	40– 60 lbs.
Average calves	60– 80 "
Heavy calves	80–110 "

The suckling calf should gain on an average 2 lbs. per day. A calf weighing 50 lbs. at birth should weigh at the end of 90 days, $2 \times 90 + 50 = 230$ lbs. Pigs should gain about 10 lbs. for each bushel of corn fed to them. Thus corn at $1.00 per bushel should be fed to hogs that can be sold for $15.00 per hundred.

The fat calf loses 50% to 60% of its live weight when butchered, while cattle lose 40% to 50% of their live weight. Hogs lose, when butchered, 25 lbs. on the first 100 lbs., 15 lbs. on the second, and 10 lbs. on each additional 100 lbs. Country-cured meats lose one third of their weight, but in packing houses there is practically no loss in curing.

Building Problems

Weatherboarding. Siding or clapboarding is dressed from wider boards. Siding 5 1/2 in. wide is dressed from a 6-in. board. A 5-in. board dresses into 4 1/2-in. siding. It is sold by the width of the board from which it is dressed. One inch is allowed for lap in weatherboarding.

To estimate weatherboarding, find the surface in square feet to be covered; add 1/3 of this to itself, if 6-in. boards are used, and add 3/7 if 5-in. are used. No allowance is usually made for doors and windows.

Shingling. Allowing for waste, it will take 1,000 shingles 4 in. wide and laid 4 in. to the weather to cover 100 sq. ft.—a so-called "square" (10 ft. each way).

A bunch of shingles contains 250 standard size shingles, taking therefore 4 bunches to a "square."

Six lbs. of nails are allowed for 1,000 shingles.

Metal Roofing is bought by the square.

Flooring. A board 2 1/2 in. wide will cover only 2 in. of floor when it is tongued and grooved; one 3 in. wide covers 2 1/2 in. but 4-in. flooring covers 3 1/4 to 3 1/2 in. of space.

To estimate the number of feet of flooring (or ceiling) required, measure the number of square feet of surface to be covered; to this add 1/4 of itself if 2 1/2-in. flooring is used, add 1/5 of itself if 3-in. flooring is used, and 3/13 if 4-in. flooring is used.

Rafters. The *rise* of a rafter is the height of its highest point above the wall plates, while the *run* is half the width of the building. The *pitch* of a roof is the *rise* of the rafters divided by the *width* of the building. A roof is 1/3 pitch if it rises 1 ft. for every 3 ft. of width of the house. A roof 1/3 pitch on a house 30 ft. wide, therefore, rises 10 ft. at its highest point.

Stonework is estimated usually per cubic yard. Brickwork is estimated by the 1,000.

To estimate the bricks in a wall, multiply the distance around the building by its height in feet and deduct for half of the openings in square feet; multiply this result by 16 for an 8-in. wall and by 24 for a 12-in. wall.

Bricks are usually 2″ x 4″ x 8″ and average in weight 5 lbs. A flue for one stove is 8″ x 8″ in the clear and takes 6 bricks for once around and 4 rounds to build 1 ft. high; one for two stoves is 12″ x 8″ in the clear and takes 7 bricks for a round and 4 rounds for a foot high.

In painting it is usual to allow 1 gal. to every 250 sq. ft. of surface.

Levers. The teeter board, the common steelyard, scissors, wheelbarrow, pincers, crowbar, etc., are familiar examples of levers. The point of support is called the *fulcrum.*

Levers will balance when the weight or force on one end times its distance from the fulcrum is equal to the weight or force on the other end times its distance from the fulcrum.

Example: A horse pulls with a force of 150 lbs. on one end of a doubletree 18″ from the attaching clevis. How much does the horse pull at the other end if attached 20″ from the clevis?

Again, 150 × 18 = 20 × Force.
Thus, 20 × Force = 2700,
Force = 135 lbs.

Example: Where must a doubletrée be attached so that a horse hitched to one end of it will pull twice as much as a colt attached at the other end?

Here it is necessary to divide 4 ft. or 48 ins. so that one part is twice as long as the other. This means three equal parts of 48, on one of which the horse pulls, on the other the colt. Hence ⅓ of 48 ins. = 16 ins. leaving 32 ins., the lever on which the colt pulls and 16 ins. for the horse; i.e. 1 × 32 = 2 × 16.

Tables, Weights, Equivalents

Long or Linear Measure

12 inches (12 in. or 12″)	= 1 foot (1 ft. or 1′)
3 feet	= 1 yard
5½ yds. or 16½ ft.	= 1 rod
320 rods	= 1 mile

1 mi. = 320 rd. = 1760 yd. = 5280 ft. = 63360 in.

Surveyors' Measure

7.92 inches	= 1 link
25 links	= 1 rod
4 rods, or 100 links	= 1 chain
80 chains	= 1 mi.

Engineers generally use a steel tape 100 feet long.

Square Measure

144 square inches	= 1 square foot
9 square feet	= 1 square yard
30¼ square yards / 272¼ square feet	= 1 square rod
160 square rods	= 1 acre
640 acres	= 1 square mile

Cubic Measure

1728 cubic inches	= 1 cubic foot
27 cubic feet	= 1 cubic yard
128 cubic feet	= 1 cord

Liquid Measure

4 gills	= 1 pint
2 pints	= 1 quart
4 quarts	= 1 gallon

1 gal. = 4 qt. = 8 pt. = 32 gi.

Dry Measure

2 pints	= 1 quart
8 quarts	= 1 peck
4 pecks	= 1 bushel

1 bu. = 4 pk. = 32 qt. = 64 pt.

Avoirdupois Weight

16 ounces (oz.)	= 1 pound
2000 lb.	= 1 ton
2240 lb.	= 1 *long* ton

Avoirdupois weight is used in measuring all common articles, such as coal, hay, groceries, etc.

Troy Weight

24 grains	= 1 pennyweight
20 pennyweights	= 1 ounce
12 ounces	= 1 pound

Troy weight is used in measuring gold, silver, precious stones, etc.

Weights of Produce as used in most States

Articles	Pounds per bushel	Articles	Pounds per bushel
Apples........	50	Oats............	32
Beans........	60	Onions..........	57
Bluegrass seed	14	Potatoes, Irish or white.........	60
Buckwheat...	52	Potatoes, sweet..	55
Clover........	60	Rye............	56
Corn, on cob..	70	Timothy seed....	45
Corn, shelled..	56	Wheat..........	60
Flaxseed	56		

TABLE OF EQUIVALENTS

1 acre	=	160 sq. rd. = 43,560 sq. ft. = 10 sq. chains
1 are (metric measure)	=	100 sq. meters = 120 sq. yds. = $\frac{1}{40}$ acre
1 barrel	=	31½ gallons
1 barrel cement	=	4 bags = 376 lbs. = 3.8 cu. ft.
1 barrel refined oil	=	42 gallons
1 barrel flour	=	196 lbs.
1 barrel salt	=	280 lbs.
1 bushel (heaped)	=	2,688 cu. in. to 2,747 cu. in.

TABLE OF EQUIVALENTS—*Continued*

1 bushel (stroked)	=	2150.4 cu. in. = $1\frac{1}{4}$ cu. ft. = 35.24 liters
1 bushel coal	=	80 lbs.
1 cu. centimeter	=	.0610 cu. in. = 1 gram
1 cu. ft.	=	4/5 bu. = $7\frac{1}{2}$ gals.
1 centimeter	=	.3937 in. = 10 millimeters
1 cu. ft. cement	=	100 lbs.
1 chain (Surveyors' and Gunter's)	=	4 rods = 66 feet = 100 links
1 crown (English money)	=	5 shillings
1 cu. in.	=	16.4 c.c.
1 cubit	=	18 inches
1 degree Fahrenheit (F.)	=	F = 32° + 9/5 Centigrade (C.)
1 degree of earth's circumference	=	69.16 mi.
1 dram (avoirdupois)	=	1/16 oz.
1 fathom	=	6 feet
1 foot	=	30.48 cm. = 12 inches
1 franc (French money)	=	$.193
1 furlong	=	40 rods
1 gallon	=	3.8 liters = 231 cu. in. = 8.5 lbs.
1 grain	=	.065 gram
1 gram	=	15.432 grains (avoir.) = the weight of 1 c.c. of distilled water at the temp. of melting ice.
100 grams	=	3.527 oz. (avoir.)
1 guinea (English money)	=	21 shillings
1 hand	=	4 inches
1 hogshead	=	2 bbls. = 63 gals.
1 inch	=	2.54 cm. = 25.4 mm.
1 kilogram (or kilo)	=	2.2 lbs.
.45 kilogram	=	1 lb.
1 kilometer	=	1,000 meters = .62 mile
1.6 kilometer	=	1 mile
1 knot*	=	1 *nautical* mile = 1.15 mi. per. hr.
1 league	=	3 nautical miles = 3.46 miles
1 link	=	7.92 ins. = $\frac{1}{100}$ of 66 ft.
1 lira (Italian money)	=	$.193
1 liter	=	1 kilogram = 1,000 grams = 1.1 qt. liquid = .91 qt. dry
1 mark (German money)	=	$.238
1 meter	=	39.37 ins. = 3.3 ft. = 1 ten-millionth of a quadrant of earth's circum.
.91 meter	=	1 yard
1 mile	=	5,280 feet = 8 furlongs = 320 rods = 1.6 kilometers
1 mile (nautical)	=	1.153 mi. = 1 minute of earth's circumference
1 millimeter	=	.039 in. = $\frac{1}{10}$ cm.
1 nautical mile	=	1.153 mi.
1 oz. (avoirdupois)	=	28.35 grams
3.527 oz. (avoir.)	=	100 grams
1 oz. (troy)	=	31.1 grams
1 pace	=	3 feet
1 penny (English money)	=	$.0203
1 perch, 1 pole	=	1 rod = $16\frac{1}{2}$ ft.
π	=	3.1416
1 pound (avoirdupois)	=	7,000 grains = 16 oz. = .45 kilogram
1 pound (English money)	=	$4.866
1 pound (troy)	=	5,760 grains = 12 oz.
1 quart (liquid)	=	.95 liter.
1 rod	=	1 perch or pole = $16\frac{1}{2}$ ft.
1 radian	=	$180 \div \pi = 57.3°$
1 sq. in.	=	6.5 sq. centimeters
1 shilling (English money)	=	$.243
1 yard	=	.91 meter

*A knot is not a *distance*, but a *rate of sailing*.



FARM KNOWLEDGE

VOLUME IV—PART IV

Farming Facts and Opportunities in the United States

IN Part III of Volume II, under the title Farming Systems in the United States, there were briefly described and compared the various agricultural sections or provinces into which this country may logically be divided. As citizens and landowners, however, we are more familiar with its division into artificial or political units called states, which, for agricultural purposes of comparison, are of relatively little value. For instance, several different states, by virtue of their small size and similar locations may offer almost identical farming opportunities; whereas one other state, such as Texas or California, may include within its boundaries a range of conditions extending from sub-tropical to north temperate as to climate, from sea level to mountainous as to topography, and covering the whole list of staple and fancy products as far as crop raising ability is concerned.

Nevertheless, our statistics are collected by states, our laws are made largely by states, our news is distributed according to states, our commerce and means of communication are on a state basis. For these reasons the information given on the following pages has been compiled by states. In each case the matter has been prepared, after the careful consultation of authoritative descriptive data, and then submitted to state authorities for criticism, revision and correction in accordance with local or exceptional conditions. The statistics, taken in part from Census records and in part from the very latest available Department of Agriculture reports and files, provide a basis for comparison and for a tentative judgment as to possibilities. Figures for any one year or one crop cannot, of course, tell anything like a complete story; nor can yields, prices and acreages recorded for a year when war was breaking loose reflect conditions as they were, or may be once again, in times of peace. However, since all the facts are of the same date and have been collected with the same idea in mind, they show as nearly as possible a true picture of relative conditions as they have actually existed.

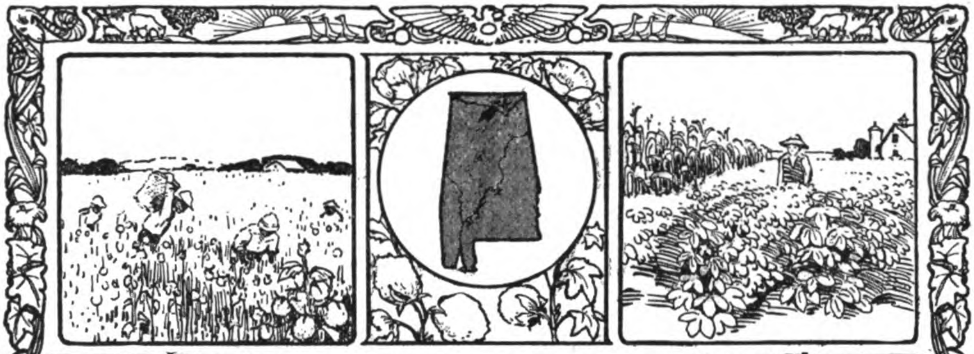
Whoever is interested in any particular state and its agricultural opportunities, should supplement the information supplied here with more detailed facts obtainable (in most cases free of charge) from various officials and departments. For example, the United States Department of Agriculture at

Washington can supply through its Bureau of Soils, Soil Maps and Surveys of many counties and smaller areas; through its Weather Bureau, the latest weather and climatic data; through its Bureau of Crop Estimates statistics as to crop acreage, yields and profits; through its Forest Service, information concerning the National Forest ranges and their use; and through its Division of Publications, various publications—including Farmers' Bulletins, Department Bulletins and circulars and reports of all kinds—many of which contain very valuable information and suggestions. The U. S. Reclamation Service, also at Washington, administers the affairs of the National Irrigation Projects and will supply prospective settlers with complete details regarding them, how to locate on them, and how best to become established. A number of the railroad systems of the country maintain colonization and agricultural departments which, rightly utilized, can be of great help. In each state there are various agencies having as either their main or subordinate aims, the distribution of information concerning their farming and industrial openings. The state departments and colleges of agriculture are among the most useful of these; their addresses are noted in the various state descriptions hereafter. When visiting a new section the farm seeker should consult also the county agent or other authorized local agricultural adviser. Finally, it should be remembered that among the best of all places to discover the real facts, are the farms of established, successful farmers, and especially their financial records for a series of years. Of course, the latter are not often available, but interested, judicious conversation usually is, and almost always is productive of helpful information and mutual advantage.

But now, to the reader, a word of caution: If times are hard, and crops and prices poor; if the neighborhood seems run down, and reports from other sections glow brightly in contrast; if taxes increase and profits diminish; if winters grow colder and summers drier and the outlook fades away into a horizon of gloom—even so, do not at once come to the conclusion that the only solution is a new location in some far distant state. Distance lends enchantment, but it may not disclose the facts; and no business more than farming thrives so well as when its roots go deep and remain undisturbed in firm, strong, well-nurtured soil. Above all, do not think of buying or in any way contracting for farm land without visiting and carefully examining it; better still, try it for a year or two—and its neighborhood as well—before locating permanently. And when, if by moving or otherwise, you do become possessed of the kind of farm that suits you, stick to it, do your best by it, and give your best to it. When you are tempted to move, think of the advice, that Abraham Lincoln gave to the friend who consulted him about such a move:

> I learned that you are anxious to sell the land where you live and move to Missouri. I cannot but think such a notion is utterly foolish. What can you do in Missouri better than here? Is the land any richer? Can you there, any more than here, raise corn and wheat and oats without work? If you intend to go to work, there is no better place than right where you are; if you do not intend to go to work, you cannot get along anywhere. Squirming and crawling from place to place can do no good. You have raised no crop this year, and what you really want is to sell the land, get the money, and spend it. Part with the land you have, and, my life upon it, you will never after own a spot big enough to bury you in.

And after reading it remember that any other state may be substituted for the one he referred to, just as the advice may just as effectively be tendered to any man, anywhere, who fails to realize that his success depends somewhat upon his surroundings, but even more upon his own knowledge, skill, adaptability and industry.—EDITOR.



ALABAMA

ALABAMA ("Cotton State") is both a Gulf State and part of the Cotton Belt, being located between 30 and 35 degrees north latitude, and 84 and 88 degrees west longitude. The Chattahoochee River forms part of the eastern boundary and the Gulf of Mexico, a part of the southern boundary. With the Tennessee River crossing the northern part, the Alabama with its tributaries draining much of the western and central parts, and numerous smaller streams flowing into these and into the Gulf, the state is well watered. Mobile Bay furnishes a good harbor. Area, 52,250 square miles, of which 710 are inland waters.

Land surface. Four zones, or belts, cross the state from east to west. In the north, the Tennessee River Valley gives a variable surface. Next below is the diversified mineral belt, mountainous in the centre and wider and higher at the eastern than at the western boundary. South of this is the prairie or cotton belt, broadening from east to west. Below this is the timber belt, about 600 feet above sea level in the north, and sloping to tide level at the Gulf. The Alabama River and its branches drain most of the western and central portions. It then unites with the Tombigbee to form the Mobile, which flows into Mobile Bay. East of this are the Conecuh and Choctawhatchee (smaller rivers flowing across Florida into the Gulf), and the Chattahoochee along the eastern boundary. The Tennessee River drains the northern part. The Appalachian Mountains enter the state from the northeast and extend about to its centre; from here the surface slopes generally to the south and west. The highest elevation is about 2,400 feet; the general average of the highland area is about 800 feet; that of the Coastal Plain 600 feet.

Soils. In the northerly, Tennessee River region or grain belt, the prevailing soil is strong clay with alluvial types in the river bottoms; these are good for grain, hay and livestock. In the mineral belt, there are rich creek and river bottoms of fertile, red soils running into barren sands and sterile, rocky hillsides. The stronger soils are excellent for fruit on the uplands and for general crops and livestock on the lower levels. The cotton belt is largely made up of a dark, retentive loam. Through the timber belt, the soil is generally a light, sandy loam, usually underlaid with clay, naturally poor but susceptible of great improvement, and fine for small fruits and vegetables.

Climate is even, mild, and generally healthful except, perhaps (as elsewhere), in the river valleys. Killing frosts seldom occur before the winter months, and rarely last more than 48 hours. The summers are long, consistently hot, with abundant sunshine and heavy rainfall, varying from 50 inches in the northern part to more than 62 inches in some parts of the south. High winds are frequent during the winter and spring. Average annual temperatures range from 58 degrees in the northeast corner to 66 degrees at Mobile. Decatur and Maple Grove in the north, and Montgomery, have recorded 107 degrees; the lowest temperature on record is 18 degrees below zero, which occurred in the northeastern uplands. Occasional light snowstorms occur in the north. The heaviest rainfall is in winter and early spring. Winds from the Gulf temper the heat in the south.

Products and industries. Leading farm activities are the raising of cotton, cereals, hay and forage, potatoes and other vegetables, fruits, sugar cane and livestock. Cotton is the main money crop, exceeding in acreage and value all other farm products. Cottonseed alone exceeds in value all cereals except corn, which leads them. In 1917, Alabama grew corn on about 1,000,000 more acres than ever before. Oats are grown to some extent, with some wheat, rice, rye and Kafir corn. Fruits and nursery stock are grown increasingly, especially in the northern part. Nearly 1,000,000 acres of peanuts were

grown in 1917. In the same year, about 2½ million acres of velvet beans were planted, largely as a catch crop in corn. This has led to large increases in the livestock industry and the bringing into the state of great numbers of cattle for fattening and breeding. Swine and sheep are raised in increasing numbers, and dairying also is increasing rapidly. Many of the old-time, large plantations have been divided into smaller farms giving increased opportunities for small farmers. Lumbering is an important industry, forests being extensive and water power plentiful.

Leading minerals are iron ore and coal in the north central and central parts. Gold has been found in small quantities, and graphite, building stone and clay are abundant. Main manufactures in the order of their value are iron and steel, lumber and timber products, cotton goods, foundry and machine-shop products, railway cars, coke, flour and by-products, and cottonseed oil, cake and fertilizers. From 1915 to 1917, about 100 mills were erected in the state to prepare the velvet bean crop that is harvested. Birmingham and Montgomery are the principal manufacturing centres.

Transportation and markets. Principal railroads are the Southern; Louisville and Nashville; Central of Georgia; Alabama Great Southern; and Mobile and Ohio. The Mobile and Alabama Rivers and Mobile Bay furnish water communication in the south, and the Tennessee River in the north. The Chattahoochee is also navigable. Mobile is an important export centre. Many livestock marketing associations have been organized in the southern part of the state, by the Marketing Specialists of the State Extension Service. They have regular sales-days, and obtain prices considerably higher than those prevailing in unorganized communities.

History. Discovered by De Soto in 1540 and first settled by the French, Fort St. Louis being built in 1702. Mobile was founded in 1711, and was for several years the seat of government of the colony of Louisiana. Ceded to England in 1763; acquired by Spain in 1779; passed into hands of the United States between 1783 and 1813. Was a part, first of Georgia, then of Mississippi. Became a territory in 1817 and a slaveholding state in 1819. Seceded in 1861. Remained under military supervision until 1868. New constitutions adopted in 1875 and 1901. Capital, Montgomery (population, 1910, 38,136); largest city, Birmingham (population, 1910, 132,685); chief port, Mobile (population, 1910, 51,521).

Agricultural organization. A Commissioner of Agriculture at *Montgomery* is in charge of various departmental, executive and control activities, especially of fertilizers and feedstuffs. The State Agricultural College and Experiment Station and headquarters of the Extension Service are at *Auburn*. The Canebrake Sub-station is at *Uniontown;* Agricultural and Mechanical College for Negroes at *Normal;* Tuskegee Institute (for Negroes) at *Tuskegee*. There is a State Farmers' Union, a State Horticultural Society, and a State Livestock Association.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,138,093;	*1,828,697*
White	1,228,834	
Colored	909,259	
(City, 370,431; country, 1,767,662)		
Number farmers	262,901;	*223,220*
(White, 152,458; non-white, 110,443)		
Land area, acres		32,818,560
Acres in farms	20,732,312;	*20,685,427*
Acres farm land improved	9,639,581;	*8,654,991*
Average acres per farm	8.9 (36.9 acres improved)	
Farms by size:		
20 to 49 acres		106,841
50 " 99 "		55,448
100 " 174 "		35,563
10 " 19 "		28,115
Value farm property	$370,138,429;	*$179,399,882*
Per cent increase in 10 years		106.3
" value farm property in land		58.6
" " " " " buildings		19.3
" " " " " stock and tools		22.1
Average value of all property per farm		$1,408
Average value of land per acre	$10.46;	*$4.84*
Per cent of farms run by owners	39.5;	*41.9*
" " " " " managers	0.2;	*0.4*
" " " " " tenants	60.2;	*57.7*

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$144,287,347
Value all cereals			30,927,210
Corn, acres	2,572,968;		*4,825,000*
bushels	30,695,737;		*77,200*
value	$28,677,032;		*$96,500,000*
av. yield per acre (10 years), bushels			16.1
Oats, acres	257,276;		*540,000*
bushels	3,251,146;		*9,720,000*
value	$2,117,703;		*$9,914,000*
av. yield per acre (10 years), bushels			18.9
Value other grains and seeds			$2,218,294
Value other crops			$95,752,540
Cotton, acres	3,730,482;		*2,195,000*
bales	1,129,527;		*505,000*
value			*$70,700,000*
av. yield per acre (10 years), pounds			16.5
Sweet potatoes, acres	66,613;	bush.,	5,314,857
	178,000;	"	*16,020,000*
Sugar cane, acres	27,211;	tons,	226,634
Peanuts, acres	100,609;	bush.,	1,573,796
	711,000;	"	*16,013,000*
Hay and forage, value			$3,357,132
acres			238,656
tons			251,403
Value vegetables			9,842,784
Value fruits and nuts			2,189,387
Apples, trees	1,468,436;	bushels,	888,396
Peaches, trees	3,177,331;	"	1,416,584
Figs, trees	52,731;	pounds,	1,773,126
Pecans, trees	44,683;	"	228,341

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			248,190
Value of domestic animals			$63,574,674
Cattle, number	932,428;	value,	13,469,626
	939,000;	"	*22,632,000*
Dairy cows, number	391,536;	"	8,569,538
	405,000;	"	*14,782,000*
Horses, number	135,636;	"	13,651,284
	150,000;	"	*14,850,000*
Mules, number	247,146;	"	31,577,217
	278,000;	"	*32,804,000*
Swine, number	1,266,733;	"	4,356,520
	1,850,000;	"	*15,725,000*

Sheep, number	142,930;	value,	$299,919
	121,000;	"	*387,000*
Poultry, number	5,028,104;	"	1,807,239
Bees, colonies	135,140;	"	212,921
Milk produced, gallons			78,728,345

Butter produced, pounds	29,550,595
Value dairy products	$6,396,198
Value poultry products	6,139,398
Value animals sold	5,543,718
Value animals slaughtered	7,606,346

ARIZONA

ARIZONA, one of the newest states and the fifth largest, is situated in the Southwest between 31 and 37 degrees north latitude and 109 and 115 degrees west longitude. The Colorado River forms nearly the whole of the western boundary. Numerous small rivers furnish limited supplies of water for irrigation in the southern part, but those in the north are rarely available because most of them run through deep cañons. Area, 113,956 square miles.

Land surface. Southern and southwestern Arizona consists of broad desert plains interspersed with nearly parallel mountain ranges of considerable height. In the extreme southwest, the surface is but little above sea level. The northern part consists of tablelands. Almost the entire state is mountainous, more than two thirds of the total area having an altitude of 3,000 feet or over. The Sierra Nevada and Rocky Mountains meet in the north central part and form the rim of the Great Basin. Here are the highest elevations: San Francisco Mountain, 12,794 feet and Humphrey Peak, 12,562 feet.

Soils. Most of the virgin soils are lacking in humus. The state is said to be "the most arid, the most desert-like part of the United States." In the southern part, the soil is a sandy loam; on the plateaus, it is alkaline; in the river valleys it is rich and deep. Much of it is not valuable for cultivation without irrigation, but numerous irrigation projects in different parts of the state furnish water for considerable areas. With abundant water much of it is highly productive. Dry-farming is being developed in parts of the state.

Climate. This is widely diversified. In the north, heavy snows are frequent. In the south, a temperature of 130 degrees has been recorded, but the dryness of the air makes high temperatures seem lower than they really are. The nights are much cooler and generally comfortable. Over large parts of this area, the temperature never reaches freezing point. In the mountain districts there are great differences between day and night temperatures. Sunshine prevails during the larger part of the year. In the northern, more elevated regions, summer temperatures reach 100 degrees and more; in the desert areas and in the mountain plateaus, 85 to 95 degrees. In the Colorado Valley, 110 to 125 degrees are recorded every summer. Mountain temperatures range lower according to elevation, the lowest recorded being 24 degrees below zero at St. Michaels in February. Rainfall is very light; in the lower Colorado Valley, sometimes not more than 3 inches occurs in a year. The average is 12 inches in the Little Colorado Valley, but there is a record of 36 inches (the highest recorded) in the Grand Cañon region. Over most of the northern area, the larger part of the rainfall is in July, August and early September, with most of the remainder from November to March. Irrigation is needed over much of the state.

Opportunities. There are said to be 1,000,000 acres that may be irrigated when water supplies are fully conserved and developed, not half of which was irrigated in 1917. About 50 different commercial crops may be grown within the state, under irrigation, because of the great diversity of climatic conditions, ranging from temperate to subtropical. Dry-farming is in the experimental stage, but a considerable range of quick-maturing drought-

resistant crops like the sorghums, sudan grass, quick-maturing corns, beans, squashes, etc., have been developed in connection with the range industry. Opportunities exist for the development of lands with scant water supply, by methods which combine dry-farming, range livestock and a supplemental, pumped irrigation water supply. At 5,000 to 6,000 feet elevation, where rainfall is more abundant but the season short, potatoes, oats, vegetables and fruits may be grown to advantage alone or combined with livestock. Information about irrigated lands may be obtained from the U. S. Reclamation Service, Washington, D. C.; about lands in general from the State Land Commission, Phœnix.

Products and industries. Leading farm activities include the raising of cereals, cotton, hay, livestock, potatoes, vegetables, fruits, sugar beets and sugar cane. Barley is the leading cereal in value, followed by wheat, corn, oats and some minor grains. Alfalfa is the leading hay crop. Alfalfa seed is an important product. Potatoes and other vegetables, fruits, sorghum, beans and nursery stock are increasing in importance. The larger part are grown under irrigation. In livestock, the greatest value is in cattle with sheep next, followed by horses and mules, swine and goats. Poultry are not so important, ostriches showing the greatest value. Dairying has not been extensively followed, but is increasing. Lumbering is not as yet an important industry. In the central part is what is known as the "Mogollon Forest," covering about 10,000 square miles, said to be one of the largest timber areas in the United States. The Coconino pine forest covers 6,000 square miles. Copper is the most important mineral, representing more than four fifths of the total mineral products. Coal, gold and silver, lead, zinc, tungsten and asbestos are also found. Leading manufactured products in order of their value are smelted and refined copper, railroad-shop products, lumber and timber products, flour and grist-mill products, dairy products, manufactured ice, and bakery products.

Transportation and markets. Two transcontinental lines traverse the state from east to west in the southern and north central parts while several minor lines form connections north and south. Water communication is not important. The mining centers furnish excellent markets.

History. Extensive ruins indicate that Arizona was the home of a highly civilized race before it was first visited by white (Spanish) explorers, about 1539. Jesuits established missions among the Indian tribes in the early part of the seventeenth century, and Tucson and Tubac were founded early in the eighteenth. There was no immigration till late in the nineteenth century. Arizona was ceded by Mexico to the United States in 1848. The section south of the Gila River was acquired by the Gadsden purchase of 1854. It was separated from New Mexico in 1863, and received a territorial government. The capital was first at Prescott in 1877, but since 1889 has been at Phoenix. Arizona became a state in 1912. Population of Phoenix, 11,134; of largest city, Tucson, 13,193.

Agricultural organization. College of Agriculture and Experiment Station, *Tucson;* substations, *Phœnix, Tempe* and *Yuma;* Northeastern Dry Farm, *Snowflake;* Dry Farm, *Prescott;* Sulphur Spring Valley Dry Farm, *Cochise.* Cattle Growers' Association; Poultry Association; Ostrich Breeders' Association, all *Phœnix;* Wool Growers' Association, *Flagstaff;* Farm Improvement Association, *Tucson;* Commission of Agriculture and Horticulture, *Phœnix,* is especially charged with police work directed against insect pests and plant diseases within the state. Inspectors are located in all counties. The State Fair is held annually at *Phœnix.*

The Experiment Station Director reports that the tendencies and prospects of agriculture include: (1) under irrigation, the more intensive development of various agricultural specialties, such as Egyptian cotton, lettuce, alfalfa, cantaloupes, etc.; (2) the development of high-grade livestock, such as dairy cows, hogs, poultry and beef cattle; (3) in dry-farming sections, the production of silage and its feeding to cattle which are supported for a part of the year on the open range; and (4) the organization of agricultural interests by means of ditch companies, livestock, fruit-growing, shippers' and other associations. The state's agriculture is unusually diverse in character, and as yet only partly developed.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	204,354; *188,931*
White	171,468
Indians	29,201
Colored	2,009
(City, 63,260; country, 141,094)	
Number farmers	9,227; *5,809*
(White, 6,024; non-white, 3,203)	
Land area, acres	72,838,400
Acres in farms	1,246,613; *1,935,327*
Acres of farm land improved	350,173; *254,521*
Average acres per farm	135.1 (38 acres improved)
Farms by size:	
100 to 174 acres	2,591
under 3 "	1,595
20 to 49 "	1,477
3 " 9 "	912
10 " 19 "	839
Value farm property	$75,123,970; *$29,993,847*
Per cent increase in 10 years	150.5
" value farm property in land	56.4
" " " " " buildings	6.6
" " " " " stock and tools	37.1
Average value of all property per farm	$8,142
Average value of land per acre	$33.97; *$5.90*
Per cent of farms run by owners	88.9; *85.8*
" " " " " tenants	9.3; *8.4*
" " " " " managers	1.8; *5.8*

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value of all crops	$5,496,872
Value of all cereals	1,570,853

Barley, acres	32,897;	*33,000*
bushels	1,008,442;	*1,155,000*
value	$2,553,000;	*$1,732,000*
av. yield per acre (10 years), bushels		37.3
Wheat, acres	20,028;	*33,000*
bushels	362,875;	*825,000*
value	$410,000;	*$1,732,000*
av. yield per acre (10 years), bushels		27.7
Corn, acres	15,605;	*32,000*
bushels	298,664;	*864,000*
value	$294,000;	*$1,642,000*
av. yield per acre (10 years), bushels		32.6
Oats, acres	5,867;	*10,000*
bushels	189,312;	*400,000*
value	$130,000;	*$384,000*
av. yield per acre (10 years), bushels		38.8
Value other grains and seeds		$204,046
Dry beans, acres	2,301; *19,000*; bushels,	18,457; *152,000*
Value hay and forage		$2,553,228
Value vegetables		505,988
Potatoes, acres	1,151 bushels,	97,141
Sugar beets, tons		49,630
Value fruits and nuts		$347,585
Apples, trees	62,027; bushels,	72,814; *135,000*
Peaches and nectarines, trees	51,415; "	50,102; *60,000*
Pears, trees	16,351; "	13,289; *31,000*
Plums and prunes, trees	12,196; "	8,420
Cherries, trees	812; "	476
Apricots, trees	6,665; "	6,849
Quinces, trees	2,453; "	1,815
Grapes, vines	131,579; pounds,	837,842
Figs, trees	3,848; "	127,081
Oranges, trees	33,373; boxes,	32,247
Olives, trees	9,353; pounds,	264,895
Small fruits, acres	76; quarts,	112,190
Value all other crops		$315,172

3. Livestock 1910 and *1917*

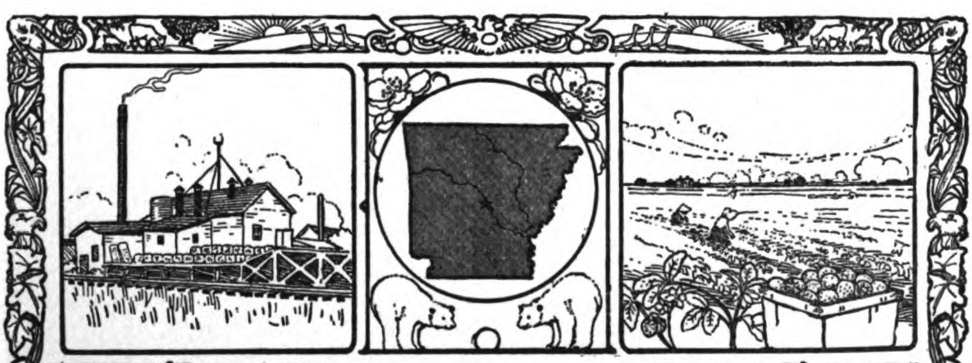
Farms reporting domestic animals		8,790
Value of domestic animals		$24,376,530
Cattle, number	824,929; *945,000*;	value, $14,624,708; *39,112,000*
Dairy cows, number	28,862; *81,000*;	value, $1,273,076; *6,885,000*
Horses, number	99,578; *129,000*;	" 4,209,726; *9,675,000*
Mules, number	3,963; *8,000*;	" 399,449; *832,000*
Asses and burros, number	7,104;	" 73,092
Swine number	17,208; *80,000*;	" 113,714; *1,040,000*
Sheep, number	1,226,733; *1,632,000*;	" 4,400,514; *10,282,000*
Goats, number	246,617;	" 555,327
Poultry, number	268,762;	" 1,545,966
Chickens, number	252,767;	" 164,327
Turkeys, number	5,498;	" 12,507
Ostriches, number	4,028;	" 1,365,000
Bees, colonies	23,770,	" 104,374
Milk produced, gallons		6,881,608
Butter produced, pounds	325,980;	value, $105,347
Value dairy products		909,411
Value poultry products		530,746
Value animals sold		4,531,545
Value animals slaughtered		315,552

4. Irrigation, 1909 and *1899*

Number of farms irrigated	4,841; *2,981*
Per cent of all farms irrigated	52.5; *73.8*
Acreage irrigated	320,051; *185,396*
Types of project and acreages:	
U. S. Reclamation Service	138,364; *43.2*
U. S. Indian Service	19,386; *6.1*
Coöperative enterprises	101,025; *31.6*
Commercial enterprises	80 —
Individual and partnership enterprises	61,196; *19.1*

Per cent of crops grown under irrigation:
Corn, 50; oats, 92.1; wheat, 89.4; barley, 98.1; alfalfa seed, 99.6; dry edible beans, 33; timothy, 44.2; clover, 99.2; timothy and clover mixed, 28; alfalfa, 98.9; potatoes, 87.8; sugar beets, 92.8; small fruits, 98.7

Yields	Irrigated	Non-irrigated
Corn, bushels	22.1	16.2
Oats, bushels	32.8	26.6
Wheat, bushels	20.0	2.2
Dry edible beans, bushels	9.0	7.5
Alfalfa, tons	2.90	0.5



ARKANSAS

ARKANSAS ("Bear State"), one of the Cotton Belt States, is situated between 33 and 37 degrees north latitude and 89 and 95 degrees west longitude. The eastern boundary is the Mississippi River, into which runs the Arkansas which divides the State in a northwest and southeast direction. Area, 53,335 square miles, 810 of which are water.

Land surface. The eastern border and southeastern corner are low and subject to overflow by the Mississippi. From here the land rises gradually, giving a rolling surface across the center of the State from northeast to southwest, and a hilly and mountainous section in the northwest where the Ozark Mountains begin. The White River drains

the northeastern section, and the Ouachita, Saline, and Bartholomew Rivers the southern part. The highest point is Magazine Mountain in the northwestern part, 2,833 feet. About 40,000 square miles are forested, much of this being in the uplands.

Soils. The soils of the uplands are usually light, including the silt loams, with some heavier clays. The lowlands show heavier and richer soils, especially along the river valleys.

Climate. This is generally mild and healthful. Temperatures range from 20 degrees below zero, the lowest recorded, to 112 degrees above, but over much of the state zero weather is rare. Average temperature for spring is 61; for summer, 79; for autumn, 62; for winter, 41.5. The frost-free season varies from 192 to 237 days. The average annual rainfall is about 48 inches. There is no lack of moisture, but snow is not common, except in the mountains. Destructive storms, except occasional hail storms and summer thunder showers, are rare.

Opportunities. About one tenth of one per cent of the farms (all in the southern part) are irrigated, chiefly for rice. There are large areas of swamp land, much of which can be made into the best of agricultural land by drainage.

Products and industries. Leading farm activities are the growing of corn, rice, cotton, hay and forage, potatoes and fruits; livestock, poultry and dairy cattle; small fruits and orchard products. Of orchard fruits, apples furnish more than half the value, peaches and nectarines most of the remainder. The small fruits are mostly strawberries. The production of livestock and dairying have increased rapidly. In order of value, mules lead with horses next, cattle, swine, poultry and sheep following. Lumbering is carried on extensively, the value of the products being considerable. The leading mineral is coal. Bauxite, zinc, lead and fullers' earth are of lesser value. Manufactures are favored by abundant bituminous coal and lumber, and there is a large output of timber products, more than all other manufactures together. Others in order of importance are oil, cottonseed and cake; flour and grist-mill products; railroad-shop construction; carriages and wagons; bakery products; foundry and machine-shop products.

Transportation and markets. Except in the north and west central sections, railroad facilities are well supplied. The Mississippi River on the east is an important factor in water communication, and the Arkansas and its tributaries through a large part of the central part. The Arkansas is navigable for about 650 miles. Leading market cities are Little Rock, Fort Smith, Pine Bluff, Hot Springs.

History. First settled in 1686. Bought from France; part of Louisiana territory until 1812, and of Missouri territory till 1819; became a State in 1836; readmitted into the Union in 1868. Capital, Little Rock; population, 1910, 45,491; also the largest city.

Agricultural organization. College of Agriculture and Experiment Station, *Fayetteville*; State Agricultural Schools, *Russellville, Jonesboro, Magnolia, Monticello;* Coöperative Demonstration Work, *Little Rock;* Horticultural Society, Farmers' Union, State Fair Association.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,574,449;	*1,311,564*
White	1,131,030	
Colored	443,419	
(City, 202,681; country, 1,371,768)		
Number farmers	214,678;	*178,694*
(White, 151,085; non-white, 63,593)		
Land area, acres	33,616,000;	*33,616,000*
Acres in farms	17,416,075;	*16,636,719*
Acres in improved farms	8,076,254;	*6,953,735*
Average acres per farm	81.1 (37.6 acres improved)	
Farms by size:		
20 to 49 acres	74,983	
50 " 99 "	45,373	
100 " 174 "	39,353	
10 " 19 "	29,875	
175 " 259 "	11,135	
Value farm property	$400,089,303;	*$181,416,001*
Per cent increase in 10 years	120.5	
" farm property in land	61.5	
" " " " buildings	15.8	
" " " " stock and tools	22.7	
Average value all property per farm	$1,864	
Average value land per acre	$14.13;	*$6.3[illegible]*
Per cent of farms run by owners	49.7;	*54.1*
" " " " " tenants	50.0;	*45.4*

2. Crop Acreages, Yields, Value, 1910 and *1917*

Value all crops		$119,419,025
Value cereals		31,262,922
Corn, acres	2,277,116;	*2,800,000*
bushels	37,609,544;	*67,200,000*
value	$27,910,044;	*$94,080,000*
av. yield per acre (10 years), bushels		19.8
Rice, acres	27,419;	*146,200*
bushels	1,282,830;	*5,994,000*
value	$1,158,103;	*$11,389,000*
av. yield per acre (10 years), bushels		40.9
Oats, acres	197,449;	*340,000*
bushels	3,212,891;	*9,520,000*
value	$1,641,752;	*$7,140,000*
av. yield per acre (10 years)		23.0
Value other grains and seeds		$553,023
Wheat, acres	60,426; value,	$532,712
	210,000; "	*6,754,000*
Kafir corn, acres	1,294; "	12,074
Hay and forage, acres		435,915
value		$4,887,139
tons		461,817
Vegetables, acres	60,251; value,	$2,245,587
	30,000; "	*3,768,000*
Potatoes, acres	29,719; "	1,439,991
	40,000; "	3,768,000
Sweet potatoes, acres	22,388; "	1,359,669
Cotton, acres	2,153,222; "	*2,645,000*
bales	776,879; "	*895,000*
value	54,559,503; "	*$126,195,000*
Cottonseed, tons	388,440; "	8,596,180
Average yield per acre (10 years), pounds		191
Sugar cane, acres		3,330
tons		19,868
Peanuts, acres	10,192;	*30,000*
bushels	168,608;	*1,110,000*
value		*$2,042,000*
Value fruits and nuts		$3,744,613
Apples, trees	7,650,103; bushels,	2,296,043
		2,683,000
Peaches and nectarines	6,859,962; "	1,901,647
		840,000

Plums and prunes, trees	731,276;	bushels,	194,649
Pears, trees	221,764;	"	*102,000*
Pecans, trees	13,958;	"	249,955
Grapes, vines	805,921;	pounds,	2,593,727

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			200,788
Value of domestic animals			$71,794,486
Cattle, number	1,028,071;	value,	$15,460,666
	952,000;	"	*28,248,000*
Dairy cows, number	425,793;	"	9,522,368
	402,000;	"	*17,688,000*
Horses, number	254,716;	"	23,152,209
	275,000;	"	*23,925,000*
Mules, number	222,200;	value,	$27,128,027
	250,000;	"	*28,500,000*
Swine, number	1,518,947;	"	5,170,924
	1,575,000;	"	*12,915,000*
Sheep, number	144,189;	"	327,984
	124,000;	"	*484,000*
Goats, number	58,294;	"	84,938
Poultry, number	5,788,570;	"	2,063,432
Bees, colonies	92,731;	"	200,049
Milk produced, gallons			83,081,875
Butter produced, pounds			29,907,337
Value dairy products sold			$6,587,428
Value poultry products sold			6,391,343
Value animals sold			12,914,397
Value animals slaughtered			7,409,195

CALIFORNIA

CALIFORNIA ("Golden State"), the largest of the Pacific Coast group, and second largest state in the Union, is situated between 32 and 42 degrees north latitude, and 116 and 125 degrees west longitude. The Colorado River is on the southeast, and on the west the Pacific Ocean. Area 158,360 square miles, of which 2,188 are water.

Land surface. The state is largely mountainous, two great ranges, the Sierra Nevada in the eastern part, and the Coast Range in the western, extending through the State from northwest to southeast. Between these lie the two Great Valleys which are like a long, narrow dish, some 500 miles from north to south and 50 miles across, with a break about halfway down the western rim where the drainage system of the valleys runs into San Francisco Bay. This system consists of the Sacramento River from the north through the Sacramento Valley and the San Joaquin from the south through the San Joaquin Valley. The Sierra Nevada range averages about 80 miles in width, and includes Mt. Whitney (more than 14,500 ft.), the highest peak in the United States outside of Alaska. Several other peaks exceed 14,000 feet, and those above 10,000 feet are numerous. In the southeast beyond the mountain ranges, is a sunken arid region containing Death Valley and the Mohave and Colorado deserts, much of which is below sea level. Besides the Great Valleys, there are many smaller valleys, plateaus and tablelands giving great variety to the state as to surface, scenery, climate, soils, crop adaptation and agriculture. Yosemite Valley is world-famed for its scenic beauty.

Soils. These are characterized by their great depth. In the interior valleys, they are largely rich, sandy loams; gravelly and lighter sandy loams are found in the more arid regions. Clay loam soils and adobes occur extensively in the central part of the Sacramento Valley and to a great extent around San Francisco Bay. Typical alluvial lands are found in the lower river bottoms. In a considerable area along the foothills of the eastern border of the Sacramento and San Joaquin Valleys, the soil is for the most part a reddish clay loam underlaid with hardpan 2 to 4 feet from the surface. Sandy soils in California that can be irrigated produce some remarkable crops and are well adapted to general farming.

Climate. The climate shows great diversity, but in general might be classified as temperate or mild. Snow is found on the highest mountain peaks at all times, and some of the northern mountainous areas have severe winters. In the great interior valleys, the winter, spring and fall are mild and temperate. The summers might be considered warm, but the

heat is of a dry nature, and is not so severe as would be indicated by the thermometers. The central and south coast section has a uniform and delightful climate the year 'round, with rarely, if ever, freezing temperatures. In the Colorado Desert, highest recorded temperature is 126 degrees in the shade, the highest for the United States also. The average annual temperatures are at Los Angeles and San Diego 60 degrees, San Francisco 55 degrees, Bakersfield 65 degrees, Shasta 52 degrees, Sacramento 59 degrees, and Crescent City 51 degrees. The rainfall, climatic and soil conditions are so diversified that general statements have little if any value. In the Great Interior Valley, Palo Verde and Imperial Valleys the rainfall is greatest in the northern part of the Sacramento Valley, the average being about 30 inches. This gradually diminishes further south until the average rainfall is only about 10 inches in the southern portion of the San Joaquin Valley. Imperial and Palo Verde Valleys have practically no rainfall, depending entirely upon irrigation water from the Colorado River. The climate is mild or temperate. On the floor of these valleys, there is some frost during the winter months, but the growing season extends over about 9 or 10 months of the year. The north-coast area receives the greatest rainfall of any portion of the state, the average being about 60 inches per year. In the central-coast area, the rainfall is variable, ranging from 30 inches to 10 inches annually, the average being about 22 inches. The climate is mild and temperate practically the year around, although there is a little frost occasionally during the winter. In the south-coast area, the rainfall averages about 16 inches. Irrigation is not extensively practised in this locality except in the orchards. The climate is temperate the year around. Rarely, if ever, are freezing temperatures felt.

Opportunities. The diversity of soil, water and climatic conditions offers facilities for the successful cultivation of almost every field, garden, or orchard crop known to temperate or sub-tropical regions. Additional irrigation water is constantly being developed in the great interior valleys and, to a limited extent, in some of the desert areas, thus bringing additional lands under intensive cultivation which always affords an opportunity for new settlers. The Agricultural Experiment Station, at Berkeley, will advise settlers regarding farming opportunities, and assist them in selecting land adapted to the particular kind of farming that they desire to follow.

Products and industries. Agricultural products far exceed the products of the mines. All the cereals are raised, but fruit growing is the leading farm industry, and livestock is raised extensively. Dairy and poultry products should receive special mention. Sugar beets are an important product. Lumbering is a very important industry. California is celebrated for its forests and the size of its trees, the largest in the world. Fisheries are valuable, salmon leading. Mining was formerly the principal industry with gold, silver, quicksilver, copper, petroleum, salt and borax the leading minerals. Main manufactures are sugar refining; meat packing; lumber and timber products; flouring; canning and evaporation of fruits and vegetables; and machine-shop products. Leading manufacturing centers are San Francisco, Los Angeles, Oakland, Sacramento, San José, Stockton, and Fresno.

Transportation and markets. California is well covered by railroads. Foreign commerce is extensive to Alaska, Hawaii, Asiatic countries, Australia and other islands of the Pacific, San Francisco being the leading port; Los Angeles, San Diego, and Eureka are other important seaports and markets.

History. Explored along the Coast by several voyagers during the sixteenth century. San Diego occupied by Spanish missionaries in 1769; San Francisco in 1776; Los Angeles in 1781. California passed under Mexican control in 1822. Became a sovereign state 1836–1845, though having a federal union with Mexico. A revolt led to its being declared a territory of the United States in 1846. Gold, discovered in 1848, led to a large immigration. Adopted a constitution prohibiting slavery in 1849 and was admitted as a State following year.

Agricultural organization. The California Fruit Exchange is the largest coöperating agricultural organization in America. Other large and similar organizations are the Associated Raisin Growers, *Fresno;* Peach Growers' Association, *Fresno;* the Prune and Apricot Growers' Association, *San José;* Bean Growers' Association, *Oxnard;* Poultry Producers' Association, *Los Angeles* and *Petaluma,* Associated Milk Producers, *San Francisco;* Sacramento Valley Dairymen's Association, *Sacramento.* State Board of Agriculture holds and conducts the State Fair at *Sacramento,* and gathers agricultural statistics; Fish and Game Commission, *Sacramento,* State Dairy Bureau, *San Francisco;* State Veterinarian, *Sacramento;* State Commission of Horticulture, *Sacramento.* The Agricultural Experiment Station is a part of the University of California, at *Berkeley,* and has farm bureau organizations in most of the agricultural counties of the state. The Grange and Farmers' Union also have organizations in this state.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,377,549; *1,485,053*
White	2,259,672;
Colored	21,645;
Other non-white	96,232;
(City, 1,469,739; country, 907,810)	

Number farmers	88,197; *72,542*
(White, 85,119; non-white, *3,078*	
Land area, acres	99,617,280
Acres in farms	27,931,444; *28,828,951*
Acres in improved farms	11,383,894; *11,958,837*
Average acres per farm	316.7 (40.8 acres improved)
Farms by size:	
20 to 49 acres	20,614
100 " 174 "	12,015
10 " 19 "	11,932
50 " 99 "	10,680
260 " 499 "	7,862
Value farm property	$1,614,694,584; *$796,527,955*
Per cent increase in 10 years	102.7
" value farm property in land	81.6
" " " " " buildings	8.3
" " " " " stock and tools	10.2
Average value all property per farm	$18,308
Average value all land per acre	$47.16; *$21.87*
Per cent of farms run by owners	75.5
" " " " " tenants	20.6
" " " " " managers	3.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$153,111,013
Value all cereals		28,039,826
Barley, acres	1,195,158;	*1,350,000*
bushels	26,441,954;	*39,150,000*
value	$17,184,508;	*$46,980,000*
av. yield per acre (10 years), bushels		28.1
Wheat, acres	478,217;	*375,000*
bushels	6,203,206;	*7,425,000*
value	$6,323,983;	*$14,850,000*
av. yield per acre (10 years), bushels		16
Oats, acres	192,158;	*196,000*
bushels	4,143,688;	*6,860,000*
value	$2,637,047;	*$5,831,000*
av. yield per acre (10 years), bushels		34
Corn, acres	1,970,492	*75,000*
bushels	35,105,917	*2,400,000*
value		*$4,440,000*
Value other grains and seeds		7,318,211
Dry beans, acres	157,987; bushels,	3,328,218
	558,000; "	*8,035,000*
Kafir corn, acres	44,308; "	938,049
Dry peas, acres	2,969; "	57,468
Hay and forage, value		$42,187,215
acres		2,533,347
tons		4,327,130
Value vegetables		$12,121,958
Potatoes, acres	67,688;	*105,000*
bushels	9,824,005;	*15,225,000*
value	$7,879,779;	*$22,838,000*
Sweet potatoes, acres	5,111;	*6,000*
bushels	572,814;	*1,002,000*
value	$355,624;	*$1,503,000*
Hops, acres	8,391;	*11,900*
pounds	11,994,953;	*15,708,000*
value	$1,731,110;	*$4,869,000*
Value other crops		$12,736,934
Value fruits and nuts		$50,706,869
Apples, trees	2,482,762; bushels,	6,335,073
		5,592,000
Peaches and nectarines, trees	7,829,011; "	9,276,118
		14,151,000
Pears, trees	1,410,905; bushels,	1,928,097
		3,523,000
Plums and prunes, trees	7,168,705; "	9,317,979
Apricots, trees	2,992,453; "	4,066,823
Cherries, trees	522,304; "	501,013
Figs, trees	269,001; pounds,	22,990,353
Oranges, trees	6,615,805; boxes,	14,436,180
		8,632,000
Lemons, trees	941,293; "	2,756,221
Olives, trees	836,347; pounds,	16,132,412
Grapefruit	43,424; boxes,	122,515
Small fruits, acres	9,687; quarts,	26,824,120
Nuts, trees	2,034,302; pounds,	28,378,115

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		80,304
Value of domestic animals		$123,024,652
Cattle, number	2,077,025; value,	$52,785,068
	2,227,000; "	*101,929,000*
Dairy cows, number	467,332;	
	591,000; "	*39,597,000*
Horses, number	468,886; "	47,099,196
	468,000; "	*45,396,000*
Mules, number	69,761; "	9,016,444
	70,000; "	*8,120,000*
Swine, number	766,551; "	5,108,803
	994,000: "	*$10,039,000*
Sheep, number	2,417,477; "	8,348,997
	2,524,000; "	*16,911,000*
Goats, number	138,413; "	320,829
Poultry, number	6,087,267; "	3,844,526
Bees, colonies	201,023; "	729,793
Milk produced, gallons		154,901,956
Butter produced, pounds		15,301,871
Value dairy products		$20,443,977
Value poultry products		12,703,948
Animals sold		13,305,165
Animals slaughtered		2,449,820

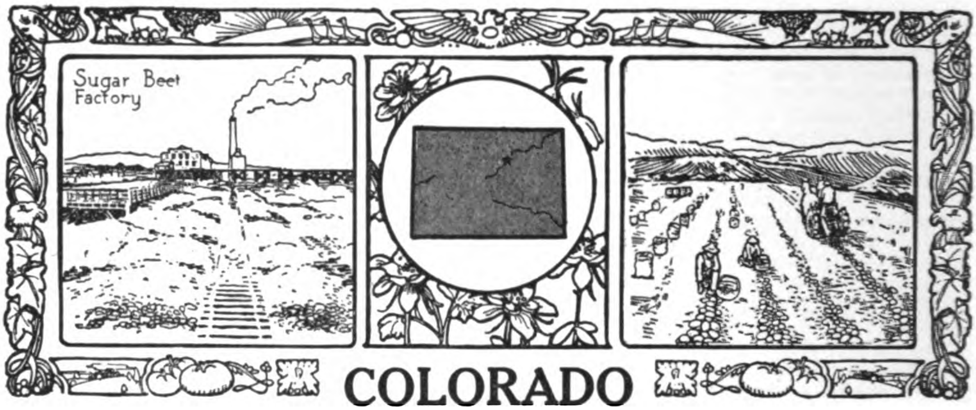
4. Irrigation, 1909 and *1899*

Number farms irrigated	39,352; *25,575*
Per cent of all farms irrigated	44.6; *35.4*
Acreage irrigated	2,664,104; *1,446,114*
Types of project and acreage:	
U. S. Reclamation Service	400
U. S. Indian Service	3,490; .1%
Irrigation districts	173,793; 6.5%
Coöperative enterprises	779,020; 29.2%
Commercial enterprises	746,265; 28 %
Individual and partnership enterprises	961,136; 36.1%

Per cent of crops grown under irrigation:
Corn, 34.3; oats, 3.1; wheat, 4.7; barley, 6.5; rye, 1.5; alfalfa seed, 29.3; dry edible beans, 7.2; dry peas, 9.8; timothy, 58.5; timothy and clover, 44.7; sugar beets, 18.6; small fruits, 71.

Yields	Irrigated	Non-irrigated
Corn, bushels	27.6;	22.9
Oats, bushels	34.9;	21.1
Wheat, bushels	18.1;	12.7
Barley, bushels	23.7;	22.0
Potatoes, bushels	158.02;	132.9
Alfalfa, tons	3.49;	3.06
Sugar beets, tons	11.7;	10.48

Fig. 371. Climatic conditions set the limits of the cotton belt. Increased production in the future depends on soil fertility, improved methods, and heavier yielding strains.



COLORADO

COLORADO ("Centennial State"), one of the Rocky Mountain States, is situated between 37 and 41 degrees north latitude, and 102 and 109 degrees west longitude. Area 103,925 square miles, 280 of which are water.

Land surface is divided into three natural sections. The great Rocky Mountain Front Range extends north and south across the state about in the center, and the western part is made up of mountain ranges and includes "parks." East of the mountains, the foothills occupy a narrow belt across the state, while the plains occupy the eastern third of the state, with an average elevation of about 4,500 feet, the lowest on the east being about 3,000 feet. More than 200 mountain peaks reach an elevation of nearly 13,000 feet, and more than 25 more than 14,000 feet. The "parks" are high inclosed valleys or plateaus between the mountain ranges of the western half, important among which are: North, South, Middle and San Luis Parks. They occupy from 2,000 to 8,000 square miles each, and the first 3 have an elevation of 8,000 feet. The Colorado River system, through the Grand River, drains the western third, the Platte and Arkansas of the Mississippi system, the eastern part. The Rio Grande originating in Southern Colorado is noted for its gorges and cañons.

Soils. Only about one third of the state is agricultural land. The soils are largely alluvial and respond readily to irrigation, which is necessary on the larger part.

Climate is notably healthful. Chief features are low humidity; abundant sunshine; light rainfall in the plains regions, 14 to 18 inches, the heaviest except on high mountains, mostly early in the growing seasons; moderately high winds; higher rainfall and snowfall in the high mountain regions, and extreme variations in temperature according to elevation. Number of rainy days, lowest 41 at Rockyford; highest, 121 at Climax. Average annual snowfall, highest, 367.4 inches at Climax; lowest, 11.2 at Delta. Average annual rainfall in agricultural section about 18 inches; highest 54.2 inches, Climax; lowest, 16.89, average at Cañon City about 12 inches. Latest spring killing frost, June 26, near Long's Peak; earliest killing fall frost, September 2, near Long's Peak; latest, October 18, Grand Junction. Highest temperature recorded at Lamar and Delta, 109 degrees in July and August, lowest, 47 degrees below zero at Lay, in February and December. The range is great because of the wide difference in elevation. The higher, the colder and the greater the rain and snowfall. Sudden and severe changes of temperature are rare.

Opportunities. The arid soil requires irrigation. About 55 per cent of all farms are irrigated, a larger area than in any other state. Smaller farms are the rule in irrigated areas, hence Colorado should furnish opportunities for the small farmer. Merchants and bankers in the cities have combined to aid farmers who lack capital to purchase sufficient seed and equipment in order to increase the production of foodstuffs. Cooperation between farmers and business men is a great help toward larger production. There are usually lands for sale on the irrigation projects, and information about them may be secured from the Reclamation Service, Department of the Interior, Washington, D. C.

Products and industries. Colorado is largely a state of special crops and special industries, developed in particular, specially-adapted localities. Potatoes are the staple in the Greeley and other districts, cantaloupes about Rockyford, fruit growing on the western slopes, and alfalfa, livestock and grain in a number of different parts. Sugar beets are an important crop, and new factories are being built. Seed growing is an important industry, the climate being specially favorable to the development and maturity of

many kinds of plants. In Colorado are one of the largest seed firms, and one of the most extensive seed-cleaning plants in the West. Cattle, horses, sheep, mules and swine are important, in order named. Many silos are being erected. Lumbering is unimportant. Leading minerals are gold, silver, lead, copper, coal and spelter. Colorado is among the first of the states in mining. Main manufactures are grist-mill products, railway cars, foundry and machine-shop products, meat products, beet sugar and canned goods. Water power is abundant, favoring manufacturing industries.

Transportation and markets. Except in the mountainous regions, railway facilities are well supplied. The mining towns and cities furnish excellent markets. There are numerous marketing associations for the different products; grain elevators, sugar-beet factories, creameries and other buildings for taking care of the products are being erected.

History. Visited by American explorers as early as 1806. Belonged to Mexico till the war of 1846. Successful gold prospecting led to considerable immigration in 1858. Territory organized in 1861; admitted as state in 1876. Capital and largest city, Denver, population (1910) 213,381. Leading cities, Pueblo, 44,395; Colorado Springs, 20,078.

Agricultural organization. State Agricultural College and Experiment Station; Extension Service and Coöperative Demonstration Work, all *Fort Collins*. Potato Growers, Association, *Montrose*.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	799,024; *539,700*
White	783,415
Negro	11,453
Other non-white	4,156
(City, 404,840; country, 394,184)	
Number farmers	46,170; *24,700*
Land area, acres	66,341,120
Acres in farms	13,532,113; *9,474,588*
Acres farm land improved	4,302,101; *2,273,968*
Average acres per farm	293.1 (93.2 acres improved)
Farms by size:	
100 to 178 acres	16,355
260 " 499 "	9,472
50 " 99 "	4,384
20 " 49 "	3,882
175 " 259 "	3,004
Value farm property	$491,471,806; *$161,045,101*
Per cent increase in 10 years	205.2
" value of farm property in land	73.8
" " " " " " buildings	9.3
" " " " " " stock and tools	16.9
Average value all property per farm	$10,645
Average value land per acre	$26.81; *$9.54*
Per cent of farms run by owners	80.1; *73.8*
" " " " " tenants	18.2; *22.6*
" " " " " managers	1.7; *3.6*

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value of all crops		$50,974,958
Value of cereals		14,787,519
Wheat, acres	340,729;	*600,000*
bushels	7,224,057;	*13,536,000*
value	$6,463,926;	*$26,124,000*
av. yield per acre (10 years), bushels		23.4
Corn, acres	326,559;	*532,000*
bushels	4,903,304;	*10,640,000*
value	$2,673,584;	*$13,300,000*
av. yield per acre (10 years), bushels		20
Oats, acres	275,948;	*293,000*
bushels	7,642,855;	*11,134,000*
value	$4,177,267;	*$8,462,000*
av. yield per acre (10 years), bushels		37.9
Value other grains and seeds		$725,866
Dry edible beans, acres	5,040;	*193,000*
bushels	53,926;	*1,467,000*
value	$128,701;	*$7,042,000*
Dry peas, acres		24,230
bushels		258,281
value		$397,540
Hay and forage value		$17,282,276
acres		1,285,064
tons		2,241,566
Value vegetables		$6,058,939
Value fruits and nuts		5,078,978
Potatoes, acres	85,839; bushels,	11,780,674; *9,310,000*
Sugar beets, acres	108,082; tons,	1,231,712
Apples, trees	1,688,425; bushels,	3,559,094; *2,640,000*
Peaches, and nectarines, trees	793,372; "	692,258; *1,200,000*
Plums and prunes, trees	143,921; "	81,539
Pears, trees	99,989; "	132,536; *320,000*
Cherries, trees	203,806; "	88,937
Value other crops		$7,041,380
Small fruits, acres	2,829; quarts,	4,294,988

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		43,033
Value of domestic animals		$68,840,485
Cattle, number	1,127,737; *1,387,000;*	value, $31,017,303; *68,825,000*
Dairy cows, number	144,734; *237,000;*	" *17,420,000*
Horses, number	294,035; *365,000;*	" 27,382,926; *33,945,000*
Mules, number	14,739; *20,000;*	" 1,798,535; *2,080,000*
Swine, number	179,294; *352,000;*	" 1,568,158; *4,224,000*
Sheep, number	1,426,214; *1,950,000;*	" 6,856,187; *14,625,000*
Goats, number	31,611;	" 80,644
Poultry, number	1,721,445;	" 1,012,251
Bees, colonies	71,434;	" 308,608
Milk produced, gallons		33,631,723
Butter produced, pounds		5,856,132
Value dairy products		$4,174,270
Value poultry products		3,074,669
Value animals sold		22,453,959
Value animals slaughtered		1,754,216

4. Irrigation, 1909 and *1899*

Number farms irrigated	25,857; *17,613*
Per cent of increase, 10 years	46.8
Acreage irrigated	2,792,032; *1,611,271*
Types of projects and acreages:	
U. S. Reclamation Service, acres	16,600
U. S. Indian Service, acres	1,020
Carey Act enterprises, acres	485
Irrigation districts, acres	115,304
Coöperative enterprises, acres	1,273,141
Commercial enterprises, acres	159,457
Individual and partnership, acres	1,226,025

Per cent of crops grown under irrigation:
Corn, 7.9; oats, 69.7; wheat, 51.1; barley, 68.3; emmer and spelt, 24.3; rye, 5.7; alfalfa, 94.4; timothy, 87.4; alfalfa seed, 57.8; dry peas, 64.1; potatoes, 69; sugar beets, 98.9; small fruits, 74.2.

Yields	Irrigated	Non-irrigated
Corn, bushels	22.1;	14.1
Oats, bushels	32.4;	16.8
Wheat, bushels	27.2;	15.0
Alfalfa, tons	2.54;	1.52
Sugar beets, tons	11.45;	6.16
Potatoes, bushels	142.00;	126.7

CONNECTICUT

CONNECTICUT ("Nutmeg State"), one of the 13 original colonies, and the southernmost New England State, is situated between 40 and 43 degrees north latitude, and 71 and 74 degrees west longitude. Area, 4,965 square miles, of which 145 are water surface.

Land surface. Several ranges of hills traverse the state from north to south, with river valleys between. The highest elevations are in the northern part, Bear Mountain (2,355 feet) and Gridley Mountain (2,200 feet). These elevations are southern extensions of the Green Mountains, the Mount Tom Range and the Blue Hills. Three large rivers cross the state from north to south, the Housatonic, the Connecticut and the Thames and its branches. The Connecticut River, the largest in New England, drains an area of more than 11,000 square miles and its valley is the chief agricultural district of the state. Long Island Sound forms the southern boundary; the general slope is from its shore northward, and from the rivers to the dividing elevations.

Soils. Those of the valleys, especially of the Connecticut, are very fertile, largely alluvial silt, or sandy loam. The lighter soils are along the Sound shore. On the higher elevations, the soil is heavier, more or less mixed with clay, and very rocky. The soils vary so much over small areas that it is hard to classify them more definitely.

Climate is temperate, though the weather is likely to be very changeable. Average annual temperature is about 50 degrees; average for winter 27 degrees, for summer, 72 degrees. Highest recorded temperature, 103 degrees at Middletown in July; lowest, 25 degrees below zero at North Grosvenor Dale in January. Earliest killing frost occurred September 19, at Hartford and Middletown; latest killing frost occurred May 17 at New Haven. Average annual snowfall ranges from 40.3 inches at New Haven to 75.8 at Cream Hill. Average annual rainfall is about 50 inches, pretty well distributed throughout the year. Fogs sometimes prevail along the shore.

Opportunities. "Abandoned" or, more accurately, "run-down" farms are less numerous than formerly. The more elevated and rocky parts of the country are specially well fitted for the dairy industry, whose products are in great demand in city markets, both in and outside the state. The lower foothills are admirably adapted for the growing of tree and small fruits and grapes. The river valleys are excellent for market gardening and special crops requiring rich soils. Poultry raising finds good conditions in the mild climate and light soils. Information about available agricultural lands may be obtained from the Agricultural Experiment Station at Storrs.

Products and industries. Leading farm activities are dairying and livestock raising, fruit and tobacco growing, truck farming and some other special lines. Dairying is the most important farm industry, milk for city trade being in great demand. Sheep are receiving more attention, as are swine. Horses are a valuable product. Poultry is important. Corn and potatoes lead as farm crops. Tobacco is a leading money crop in certain specially adapted soils of the Connecticut Valley; the product of this section equals that of any other part of the world. Onion growing is carried on extensively in the river valleys, as well as the production of most other vegetables. Seed-growing is important. Tree and small fruits of most kinds are largely grown, apples, and peaches leading the former, strawberries the latter. Great advances have been made in recent years. Fisheries along the Sound are a source of much profit, Connecticut leading the states in value of oysters. Mining is unimportant, though iron, granite, lime and feldspar are found. Connecticut is a leading manufacturing state, producing mainly brass and bronze; foundry and machine-shop products; cotton goods; silks; firearms and ammunition; woolen, worsted and

felt goods, and wool hats; silver and plated wares; corsets; automobiles; cutlery and tools. Chief manufacturing centers are New Haven, Bridgeport, Hartford, Waterbury, Meriden, Stamford, New London, Torrington, Manchester and Danbury.

Transportation and markets. Railroad transportation over most of the state is furnished mostly by the New York, New Haven, and Hartford Railroad. There is a large mileage of electric railways, many of which carry freight and express. Water transportation by way of Long Island Sound is important. The Connecticut River is navigable to Hartford, and, by small vessels, beyond the borders of the state. Excellent markets for choice products are found in the great cities of New York and Boston and every manufacturing city and town in the state is a good, safe home market.

History. Dutch settlers from New Netherlands established a trading post at Hartford in 1633. First English settlements by colonists from Massachusetts in 1634 at Wethersfield, 1635 at Windsor and Hartford. Many immigrants from Massachusetts in 1636–1637. Declared itself free and independent state in 1776. Not in sympathy with War of 1812. In the Civil War Connecticut furnished a large quota of troops for Federal service.

Agricultural organization. Agricultural College and Experiment Station, *Storrs*. A second Experiment Station at *New Haven*. Coöperative Demonstration Work, *Storrs*. State Board of Agriculture, Pomological Society, Alfalfa Growers' Association of Connecticut, Beekeepers' Association, Dairymen's Association, Poultry Association, Sheep Breeders' Association, Vegetable Growers' Association, New England Tobacco Growers' Association, Horticultural Society, State Agricultural Society, State Grange, Nurserymen's Association.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,114,756;	*908,420*
White	1,098,897	
Negro	15,174	
Other non-white	685	
(City, 999,839; country, 114,917		
Number farmers	26,815;	*26,948*
Land area, acres	3,084,800;	*3,084,800*
Acres in farms	2,185,788;	*2,312,083*
Acres farm land improved	988,252;	*1,064,525*
Average acres per farm	81.5 (36.9 acres improved)	
Farms by size:		
50 to 99 acres	6,634	
20 " 49 "	6,306	
100 " 174 "	4,999	
10 " 19 "	3,119	
3 " 9 "	2,693	
Value farm property	$159,399,771;	*$113,305,580*
Per cent increase in 10 years	40.7	
" value farm property in land	45.3	
" " " " " buildings	41.5	
" " " " " stock and tools	13.2	
Average value all property per farm	$5,944	
Average value land per acre	$33.03;	*$22.68*
Per cent of farms run by owners	86.6	
" " " " " tenants	9.8	
" " " " " managers	3.5	

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$22,487,999
Value all cereals		2,039,211
Corn, acres	52,717;	*95,000*
bushels	2,530,542;	*4,845,000*
value	$1,693,939;	*$10,417,000*
av. yield per acre (10 years), bushels		44.4
Oats, acres	10,207;	*20,000*
bushels	273,804;	*660,000*
value	$161,188;	*$591,000*
av. yield per acre (10 years), bushels		31.4
Rye, acres	7,601;	*7,000*
bushels	137,692;	*144,000*
value	$123,848;	*$302,000*
av. yield per acre (10 years), bushels		19
Buckwheat, acres	2,797;	*3,000*
bushels	51,751;	*52,000*
value	$45,532;	*$104,000*
av. yield per acre (10 years), bushels		18.7
Value other grains and seeds		$47,112
Dry beans, acres	208; bushels,	2,845
Wheat, acres	616; "	11,869
Barley, acres	141; "	2,474
Value hay and forage		$7,224,500
Value vegetables		3,851,867
Potatoes, acres	23,959; bushels,	2,684,414
Tobacco, acres	16,042; pounds,	28,110,453
Value fruits and nuts		$1,692,451
Apples, trees	798,734; bushels,	1,540,996 / *1,316,000*
Peaches, trees	461,711; "	269,990 / *268,000*
Pears, trees	56,788; "	41,322 / *29,000*
Plums and prunes, trees	30,209; "	13,663
Cherries, trees	12,119; "	3,617
Grapes, vines	107,054; pounds,	1,317,682
Small fruits, acres	1,597; quarts,	3,823,522
Nuts, trees	9,248; pounds,	137,987

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			24,262
Value of domestic animals			$13,133,340
Cattle, number	195,318;	value,	6,730,287
	194,000;	"	*11,142,000*
Dairy cows, number	122,853;	"	
	121,000;	"	*8,894,000*
Horses, number	46,341;	"	5,739,400
	46,000;	"	*6,762,000*
Mules, number	416;	"	72,721
Swine, number	52,372;	"	472,741
	58,000;	"	*1,015,000*
Sheep, number	22,418;	"	112,349
	18,000;	"	*137,000*
Goats, number	500	"	2,785
Poultry, number	1,265,702;	"	988,653
Bees, colonies	9,445;	"	41,839
Milk produced, gallons			45,749,849
Butter produced, pounds			3,498,551
Value dairy products			$7,669,183
Value poultry products			3,530,904
Value animals sold			2,687,816
Value animals slaughtered			753,285

DELAWARE

DELAWARE ("Blue Hen State") is one of the North Atlantic States, situated between 38 and 40 degrees north latitude, and 75 and 76 degrees west longitude. It is the second smallest of the states, having an area of 2,050 square miles, of which 90 square miles are water.

Land surface. Most of the state is nearly level and belongs to the Atlantic Coastal Plain. A central sandy ridge nowhere more than 70 feet high extends north and south, dividing the drainage basins of the Chesapeake and Delaware Bays. Numerous small streams flow into these. The highest point, 280 feet above tide water, is in the north where are some rolling and hilly lands. There are marshy areas and shallow bays along the coast.

Soils. In the north are some heavy clays and clay loams. A belt of loam follows the shores of Delaware Bay. Through the center, sandy and silt loams prevail. In the south, sandy soil predominates with underlying clay which often approaches the surface, producing clay loam. Some reclaimed swamps supply a rich alluvial soil.

Climate is mild, generally healthful. The average annual temperature at Dover is 54.7 degrees. The highest temperature recorded is 104 degrees at Milford, in July, and the lowest 12 degrees below zero at the same place in January. Average date of first killing frost in autumn is October 17, at Milford, earliest date being October 2. Average date of latest killing frost in spring is April 23 at Millsboro, latest being May 12 at Newark and Seaford. The average annual rainfall is from 40 to 50 inches, well distributed through the year so that harmful droughts are rare. Snowfall is light, 24 inches being the highest recorded figure for any year.

Opportunities. Delaware is distinctly agricultural. Its mild climate, long growing season, fertile soil, frequent and abundant rains, adapt it to a large variety of crops and fruits. Its location within easy shipping distance of large cities on either side, render marketing easy. There is no public land except some sand dunes in Sussex County.

Products and industries. The leading industry is fruit growing, apples being the main tree fruit, especially in the central part. Pears, peaches, plums and grapes are largely grown. Strawberries are the leading small fruit, and immense quantities are produced. Truck farming is an important industry. Dairying is extensive in the north, and poultry raising throughout the state. Fisheries are important, shad and trout leading. Minerals are unimportant. Manufacturing enterprises turn out leather, cars, ships, foundry and machine-shop products, paper and wood pulp, flour, and canned vegetables and fruits. The last mentioned industry is very important. Wilmington is the chief manufacturing city (population in 1910, 87,411, in 1917, 106,000.)

Transportation and markets. Railroad facilities are good. Electric railways are improving what is sometimes criticised as too little railroad competition. There are many miles of state roads in New Castle County. One of the public-spirited citizens has already built a boulevard through most of Sussex County, and has offered to build a road to connect it with the northern part of the state, the specifications of which are to be prescribed by the State Highway Commission. Wilmington is the only seaport, and aside from this, water transportation is confined mostly to vessels of light draft, running to nearby towns by way of Delaware and Chesapeake Bays. The chief markets are the large cities of nearby states, Philadelphia; Jersey City, Newark, New Jersey; Pittsburg, Chester, Pa.; New York, New Haven, Boston, Buffalo. By means of refrigerator cars, most markets within 1,000 to 1,500 miles are reached with perishable products.

History. Colony founded by the Dutch in 1631, on Lewis Creek, was destroyed by Indians. Swedish settlement made in 1638 near present site of Wilmington. From 1640 to 1656 incessant warfare between Swedes and Dutch, the latter finally winning. From 1664, except one brief period, under English control till the Revolutionary War. Ceded to Wm. Penn in 1683, and considered part of Pennsylvania till 1703, when it was allowed a separate legislature. Separate state government established in 1776. First state to ratify the U. S. Constitution, December 7, 1787. Slave-holding state; sentiment divided during Civil War, but supported Union Cause.

Agricultural organization. State Board of Agriculture is located at *Dover*. State Fair is held at *Wilmington*. Agricultural College and Experiment Station are located at *Newark*. State College for colored students at *Dover*.

The Director of the State Experiment Stations reports that Delaware is entering upon a new era, not only in industry but also in agriculture and in education. The world demand for powder has materially increased the importance of the state, and it is quite probable that the demand for dyes and other pigments that formerly came from Europe will soon be supplied by the manufacturing companies of this state. The ship builders of Delaware are adding to their facilities in order to help meet the call for more ocean-going vessels, a demand that will take many years to supply.

On account of great markets close at hand, there has been a marked tendency for the agriculture of Delaware to take the direction of intensive crops, such as tree fruits (especially apples), berries, tomatoes, sweet and round potatoes, cantaloupes, watermelons, early cabbage, and asparagus. The war shortened the labor supply to such an extent that many farmers are giving up trucking crops, and growing more wheat and corn.

Statistics

1. Farms and Farm Property, 1910 and *1900*

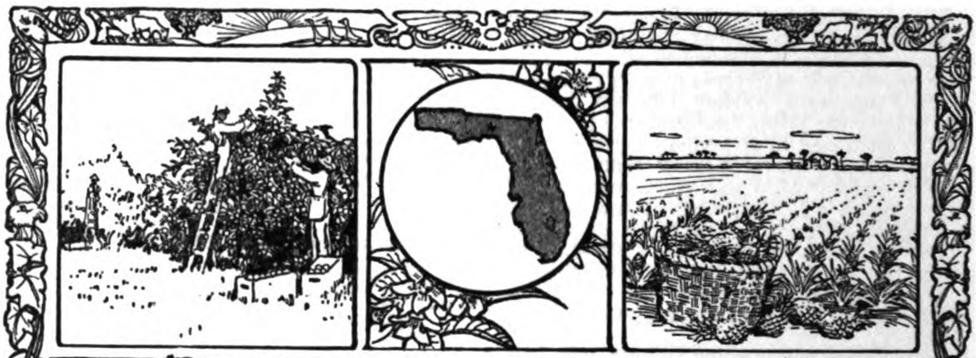
Population	202,322; *184,735*
White	171,102
Negro	31,181
Other non-white	39
(City, 97,085; country, 105,237)	
Number farmers	10,836; *9,687*
(White, 9,914; non-white, 922)	
Land area, acres	1,257,600
Acres in farms	1,038,866; *1,066,228*
Acres farm land improved	713,538; *754,010*
Average acres per farm	95.9 (65.8 acres improved)
Farms by size:	
50 to 99 acres	2,977
100 " 174 "	2,849
20 " 49 "	1,988
Farms by size (*continued*):	
175 to 259 acres	994
10 " 19 "	831
Value farm property	$63,179,201; *$40,697,654*
Per cent increase in 10 years	55.2
" value farm property in land	55.3
" " " " " buildings	28.8
" " " " " stock and tools	15.9
Average value all property per farm	$5,830
Average value all land per acre	$33.63; *$22.99*
Per cent of farms run by owners	57; *48.3*
" " " " " tenants	41.9; *50.3*
" " " " " managers	1.1; *1.4*

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$9,121,809
Value all cereals			4,692,329
Corn, acres	188,755;		*230,000*
bushels	4,839,548;		*7,820,000*
value	$3,340,000;		*$10,948,000*
av. yield per acre (10 years), bushels			32.3
Wheat, acres	111,215;		*131,000*
bushels	1,643,572;		*2,162,000*
value	$3,013,000;		*$4,497,000*
av. yield per acre (10 years), bushels			16.6
Oats, acres	4,226;		*4,000*
bushels	98,239;		*128,000*
value	$74,000;		*$100,000*
av. yield per acre (10 years), bushels			30.1
Value other grains and seeds			$4,692,329
Dry peas, acres	1,615;	bushels,	12,521
Buckwheat, acres	4,002;	"	53,903
	3,000;	"	*60,000*
Rye, acres	1,017;	"	11,423
	1,000;	"	*16,000*
Dry edible beans, acres	55;	"	648
Value hay and forage			$1,174,473
Value vegetables			1,832,699
Value other crops			474,567
Potatoes, acres	9,703;	bushels,	880,360
	13,000;	"	*1,235,000*
Sweet potatoes and yams, acres	5,229;	"	733,746
	5,000;	"	*560,000*
All other vegetables, acres			22,939
Value fruits and nuts			$890,436
Apples, trees	429,753;	bushels,	183,094
			450,000
Peaches and nectarines, trees	1,177,402;	"	16,722
			647,000
Pears, trees	449,692;	"	103,357
			294,000
Plums and prunes, trees	27,115;	"	657
Cherries, trees	16,145;	"	2,634
Grapes, vines	260,963;	pounds,	1,938,267
Small fruits, acres	8,687;	quarts,	14,425,209

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			10,450
Value of domestic animals			$6,243,368
Cattle, number	54,986;	value,	1,648,333
	64,000;	"	*3,078,000*
Dairy cows, number	35,708;		
	43,000;	"	*2,408,000*
Horses, number	33,065;	"	3,451,791
	36,000;	"	*3,420,000*
Mules, number	5,935;	"	764,133
	6,000;	"	*696,000*
Swine, number	49,260;	"	337,910
	60,000;	"	*696,000*
Sheep, number	7,806;	"	36,898
	8,000;	"	*47,000*
Poultry, number	876,081;	"	560,146
Bees, colonies	6,410;	"	13,609
Milk produced, gallons			7,859,857
Butter produced, pounds			1,563,161
Value dairy products			$1,089,497
Value poultry products			1,712,568
Value animals sold			768,034
Value animals slaughtered			570,575



FLORIDA

FLORIDA ("Peninsular State"), most southerly of the United States, between 24 and 31 degrees north latitude, and 79 and 88 degrees west longitude. Area 58,666 square miles, of which 3,805 are water surface.

Land surface. Generally level except in the northwestern part which is somewhat hilly, but no elevations exceed 350 feet. The highlands of Georgia and Alabama extend into the State. A central axis of about 350 feet elevation runs through the peninsula north and south, somewhat east of the middle portion, making the watershed most largely towards the Gulf of Mexico with a gradual slope from sea level up to the center axis on both sides, also from the Gulf north along the western portion. The larger portion of the state is less than 100 feet above sea level. The waters of the Suwanee, which empty into the Gulf of Mexico, and the waters of the St. Mary's, which empty into the Atlantic Ocean, at places come from the same lake. These two rivers form a natural depression separating the highlands of central and south Florida from the highlands of Georgia. The St. Johns River is navigable for nearly 250 miles, and is the only river in the United States of considerable size which flows northward. Some 1,200 to 1,400 lakes have been listed and named. Lake Okeechobee is the largest of the fresh-water lakes, and among the largest fresh-water lakes occurring wholly within the United States; its elevation is about 22 feet above sea level.

Formerly the Everglades extended northward to the latitude of Tampa; by drainage more than a million acres of the northern portion were made fit for grazing purposes nearly 30 years ago.

Soils. The larger portion of the surface of Florida is covered with sand, stiff clay occurring in east and west Florida and occasionally in peninsular Florida. Among the best lands in the state are those that are covered with a gray sandy soil with a slight admixture of clay. These soils occur either in west Florida or throughout the peninsula, usually at the higher elevations. Hardwood areas, when occurring on the sandy regions along the coast and throughout peninsular Florida, are spoken of as hammock lands. The essential difference between hammock soils and pine-wood soils is that fires, which have swept over the pine-woods lands for countless ages, have been barred by the hammocks, allowing a natural accumulation of organic matter in these regions.

Climate. The lowest temperature in the last 50 years was 3 degrees below zero in the western part. In extreme south Florida, the temperature rarely goes below 32 degrees, and frosts are frequently absent for the entire year. The heaviest rainfalls occur during the summer months, May, June, July and August. The average rainfall is about 50 inches; during some years, this may reach 75 inches, and during dry years as low as 35 inches. West Indian hurricanes sometimes pass over the state; their violence is not equal to that of a cyclone, but the area covered is much more extensive. The loss of human life is a very unusual occurrence in these hurricanes. Cyclones are practically unknown.

Opportunities. The state is draining the Everglades at an expense of about $6,000,000. Nearly all the drained lands will produce large quantities of forage and other farm crops. Truck growing is carried on where transportation is available. Some of these lands have been much misrepresented, and no one should buy these or other lands without seeing them. Good opportunities also exist on the higher lands. Over a large part of the state, flowing artesian wells may be obtained which furnish abundant water at a nominal cost. A few homesteads are still vacant, whose location may be ascertained at the U. S. Land Office, Gainesville. They are mostly located at considerable distances

from transportation facilities. State lands occur in a number of different places and a large body of the drained land is owned by the state. Information may be obtained from the Commissioner of Agriculture, Tallahassee. The state owns more than 1,000,000 acres, some of which may be purchased in farm size at reasonable prices. The draining of the Everglades is carried on by the Board of Internal Improvements, from whom information may be obtained at Tallahassee. The fine winter climate attracts many winter visitors to the state, and these help to furnish local markets for all kinds of agricultural products.

Products and industries. The leading crop is citrus fruits, the principal attention being devoted to grapefruit and oranges. Corn leads the farm crops; velvet beans, sweet potatoes, cotton and peanuts are important crops. Tobacco of the finest grade is produced in considerable quantity. Strawberries are grown largely, especially for mid-winter and early spring delivery. Pineapples are grown extensively along the east coast. Tropical fruits, of which the avocado is taking the lead, are produced in the extreme southern portion. Livestock raising, especially the production of cattle on large ranges, is important. Hog raising is growing rapidly. Lumbering, turpentining and rosin production have been carried on largely in the virgin forests. The state still contains a large area suitable for this work. The fisheries are among the most important industries in the state. Florida ranks fifth in the United states in its output. Sponge fishing is an important and leading line. Oysters are shipped in large quantities. The only mineral of great importance in the state is rock phosphate, of which Florida furnishes about three fourths of the American output.

Transportation and markets. Railroads are found in all parts of the state, no county being without them. The numerous deep lakes and deep rivers furnish ample waterways for transportation in all parts of the state. Foreign and coastwise shipping is an important adjunct. The extensive coast line gives many fine shipping ports. The principal ports are Jacksonville, Tampa, Pensacola and Key West.

History. Ponce de Leon landed on the shores of Florida in 1513, and took possession for the King of Spain. Other Spanish explorers made attempts at settlement during the next 50 years, but with little success because of the hostility of the natives. 1763, ceded by Spain to Great Britain, returned to Spain in 1783. Sold by Spain to United States in 1819, organized into a territory 1819, admitted as State 1845. Seceded in 1861, adopted new Constitution and readmitted to Union 1868.

Agricultural organization. The Commissioner of Agriculture, located at *Tallahassee*, has charge of the enforcement of fertilizer, feed and pure-food laws, the sale of state lands and numerous other duties in connection with the agriculture of the state. The State Plant Board has its official offices on the campus of the University at *Gainesville*, Its duty is to prevent the introduction and dissemination of noxious insects and plant diseases, as well as to control and eradicate those already in the state. The State Livestock Sanitary Board has its central offices at *Tallahassee*, the Commissioner of Agriculture being Chairman of the Board. Its duty is to prevent the introduction and dissemination of diseases among livestock, as well as to control or eradicate such disease already in the state. The State Agricultural College and Experiment Station are located on the University campus at *Gainesville*. The Extension Division concerns itself with all the agricultural work carried on by the University off the Campus. A county agent, for furthering agricultural work is located in each county. In addition to the county agent each county has a Home Demonstration Agent, whose duty it is to instruct the rural women and girls in better methods of homemaking and conservation of food. The Agricultural and Mechanical College for Negroes is located at *Tallahassee*. This institution is a separate organization from the Agricultural College, but is working under the direction of the same Board of Control.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	752,619; *528,542*
White	443,634
Colored	308,669
Other non-white	315
(City, 219,080; country, 533,539)	
Number farmers	50,016; *40,814*
(White, 35,295; non-white, 14,721)	
Land area, acres	35,111,040
Acres in farms	5,253,538; *4,363,891*
Acres farm land improved	1,805,408; *1,511,653*
Average acres per farm	105 (36.1 acres improved)
Farms by size:	
20 to 49 acres	17,169
50 " 90 "	9,999
100 " 174 "	8,178
10 " 19 "	5,019
3 " 9 "	3,758
Value farm property	$143,183,183; *$53,929,064*
Per cent increase in 10 years	165.5
" value of farm property in land	65.5
" " " " " " buildings	17.0
" " " " " " stock and tools	17.5
Average value all property per farm	$2,863
Average value land per acre	$17.84; *$7.06*
Per cent of farms run by owners	70.8
" " " " " tenants	26.7
" " " " " managers	2.5

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$36,141,894
Value all cereals	6,175,973
Corn, acres	605,771; *925,000*
bushels	7,023,767; *13,875,000*
value	$5,709,009; *$19,425,000*
av. yield per acre (10 years), bushels	13.6
Oats, acres	43,206; *55,000*
bushels	606,380; *770,000*
value	$443,104; *$755,000*
av. yield per acre (10 years), bushels	16.3

Rice, acres	623;		*800*
bushels	12,341;		*21,000*
value	$15,290;		*$41,000*
av. yield per acre (10 years), bushels			25.1
Value other grains and seeds			$2,446,183
Peanuts, acres	126,150;	bushels,	2,315,089
	40,000;	"	*1,400,000*
Dry peas, acres	7,144;	"	56,713
Dry edible beans, acres	2,641;	"	31,835
Hay and forage value			$847,485
acres			54,729
tons			55,300
Value vegetables			$8,385,242
Value fruits and nuts			7,712,549
Peaches and nectarines, trees	290,850;	bushels,	114,998
			122,000
Pears, trees	110,709;	"	98,223
			46,000
Plums and prunes, trees	39,921;	"	17,169
Apples, trees	8,180;	"	3,405
Grapes, vines	20,962;	pounds,	1,086,344
Tropical fruits, trees and plants			39,761,368
Pineapples, plants	36,190,758;	crates,	778,644
Oranges, trees	2,766,618;	boxes,	4,852,967
			4,200,000
Pomeloes, trees	656,213;	"	1,061,537
Figs, trees	12,784;	pounds,	474,287
Lemons, trees	11,740;	boxes,	12,367
Strawberries, acres	1,343;	quarts,	2,383,397
Pecans, trees	42,512;	pounds,	307,632
Value other crops			$10,574,462
Cotton, acres	263,454;		*185,000*
bales	65,056;		*40,000*
value	$4,841,581;		*$10,100,000*
av. yield per acre (10 years), pounds			124
Tobacco, acres	3,987;		*3,100*
Tobacco: pounds	3,505,801;		*3,410,000*
value	$1,025,476;		*$1,944,000*
av. yield per acre (10 years), pounds			920
Sugar cane, acres			12,928
tons			142,517
sirup made, gallons			2,533,096
Potatoes, acres	8,509;	bushels,	856,967
	25,000;	"	*2,275,000*
Sweet potatoes and yams, acres	21,995;	"	2,083,665
	35,000;	"	*3,500,000*

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			44,880
Value of domestic animals			$19,818,905
Cattle, number	845,188;	value,	$9,262,262
	1,006,000;	"	*20,335,000*
Dairy cows, number	116,041;	"	
	141,000;	"	*6,063,000*
Horses, number	45,640;	"	4,854,699
	60,000;	"	*7,200,000*
Mules, number	23,333;	"	3,545,821
	31,000;	"	*5,146,000*
Swine, number	810,069;	"	1,848,731
	1,100,000;	"	*7,150,000*
Sheep, number	113,701;	"	256,166
	119,000;	"	*321,000*
Goats, number	47,371;	"	40,521
Poultry, number	1,326,271;	"	673,814
Bees, colonies	38,895;	"	98,468
Milk produced, gallons			7,676,459
Butter, produced, pounds			1,705,274
Value dairy products			$974,486
Value poultry products			2,057,437
Value animals sold			1,350,243
Value animals slaughtered			2,699,568

GEORGIA

GEORGIA ("Empire of the South"), one of the Cotton Belt states and the largest east of the Mississippi River, is situated between 30 and 35 degrees north latitude, and 81 and 86 degrees west longitude. The Chattahoochee River forms about half the western boundary, and the Atlantic Ocean and Savannah River all of the eastern boundary. Area, 59,265 square miles, of which 540 are water. About 40,000 square miles are in forests.

Land surface. There are 3 general divisions: in the northwest are the Appalachian Mountains, with elevations of 3,000 to 5,000 feet, the highest point being Sitting Bull Mountain (5,046 feet). The Piedmont Plateau occupies the north central region. It merges, about the center of the state, into the Coastal Plain at an elevation of about 575 feet, and the latter slopes gently to the south and east to sea level at the coast. The northwest part of the state is drained by the Coosa and Tallapoosa Rivers, which reach the Gulf through the Alabama and Mobile Rivers. The southwest is drained by the Chattahoochee and Flint Rivers, uniting to form the Apalachicola. The Altamaha drains the larger part of the southern and central part, flowing into the Atlantic, and navigable for a considerable distance. The

Savannah River, on the eastern boundary, is navigable as far as Augusta.

Soils. These are greatly diversified. Those of the Coastal Plain are largely sandy loams and clays, the river valleys being chiefly alluvial. The northern part has mainly a thin red soil, with a stiff red clay subsoil; and some limestone land.

Climate. The climate is said to cover 10 degrees of latitude in range, that of the northern mountainous region being not unlike that of the North Atlantic states. It is mainly temperate and healthful except along the southern coast region. Average rainfall for the state is 49.5 inches; it varies from 72 inches in the northeast to 39 inches in the east central part. Snow is usually scanty, occurring generally in January and February, but it has fallen all over the state and to a depth of 2 inches in the southern part. Records of more than 2 feet in a month have been made in the north. In the northern and western section, the highest recorded temperatures are 108 degrees at Quitman and 106 degrees at Thomasville, Albany and Lumpkin. Lowest on record are 12 degrees below zero at Tallapoosa, 11 below at Dahlonega, and 10 below at Greenbush and Ramsey, but such low temperatures are extreme and rare. The average annual temperature at Diamond (2,020 feet elevation) is 57 degrees. Earliest killing frost in autumn October 1 at Tallapoosa; average date at same place, October 30. Latest date of killing frost in spring, May 10 at Ramsey and Dahlonega; average date for these same places April 10. In southern and eastern section, highest recorded temperature is 107 degrees at Waycross and Point Peter in August; lowest 11 degrees below zero at Dahlonega in February. Average annual temperature at this place was 58.4.

Opportunities. Because of the differences in elevation, a great variety of agriculture and horticulture is possible. A narrow tidewater belt produces rice and subtropical fruits. The Coastal Plain region offers opportunities for both subtropical and temperate climate products, while the northern part is adapted to livestock and all northern products. In some parts and seasons, irrigation would be an advantage. Information about available farming lands may be obtained from the Commissioner of Agriculture, Atlanta.

Products and industries. Leading farm activities are the production of vegetables for the northern markets along the coast; cotton, pears and melons, a little inland; further back, peaches and grapes and upland cotton, and in the north, grains, apples, cherries and livestock. Georgia leads all states in the production of peaches. Trucking and fruit growing are increasing in importance. Anything that can be grown anywhere in the United States except tropical fruits can be grown somewhere in the state. Lumbering is an important industry. Fisheries are considerable, about half their value being in oysters. Minerals are not of great importance. Gold and silver have been found in small quantities, also coal, iron, granite, marble, asbestos, graphite. Georgia is a leading industrial state with excellent water power and favorable transportation facilities. Its manufactured products include cotton goods, timber, products, oil, fertilizers, turpentine and resin, hosiery and knit goods, marble and stone work, carriages and wagons, confectionery, leather goods, furniture and refrigerators.

Transportation and markets. All important railway systems of the South traverse Georgia. With their branches, they cover the state pretty thoroughly. Water communication is also excellent, by means of the larger rivers and the Atlantic from several ports.

History. First traversed by De Soto, 1540. Part of tract granted to the lord's proprietors of Carolina 1663–1665. Received provincial charter in 1719, and chartered as independent colony 1732. Put under provincial government in 1752. Provincial congress convened 1775. Remained under British control till 1782. In 1888 Georgia ratified the Federal constitution; a new state constitution went into effect in 1789, and another 1798, the latter prohibiting the importation of slaves. Seceded in 1861, ordinance repealed in 1865. After much conflict with Federal government, was readmitted in 1870. Capital, Atlanta; population, 1910, 154,839. Other leading cities, Savannah, 65,064; Augusta, 41,040; Macon, 40,665; Columbus, 20,554.

Agricultural organization. State College of Agriculture, *Athens;* Experiment Station, *Experiment;* Industrial College for colored youths, University of Georgia, *Savannah.* Commissioner of Agriculture, *Atlanta;* Agricultural Society, *Waycross;* Farmers' Union, *Douglas;* Horticultural Society, Dairy and Livestock Association, Breeders' Association, Forest Association, *Athens;* State Fair Association, *Macon;* Game Protective Association, *Atlanta.*

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,609,121; *2,216,331*
White	1,431,812; *1,181,294*
Colored	1,177,309; *1,035,037*
(City, 538,650; country, 2,070,471)	
Number farmers	291,027; *224,691*
(White, 168,468; non-white, 122,559)	
Land area, acres	37,584,000
Acres in farms	26,953,413; *26,392,057*
Average acres per farm	92.6 (42.3 acres improved)
Farms by size:	
20 to 49 acres	117,432
50 " 99 "	68,510
100 " 174 "	42,275
10 " 19 "	20,929
Value farm property	$580,546,381; *$228,374,637*
Per cent increase in 10 years	154.2
" value of farm property in land	63.8
" " " " " " buildings	18.7
" " " " " " stock and tools	17.4
Average value all property per farm	$1,995
Average value land per acre	$13.74; *$5.25*
Per cent of farms run by owners	33.9

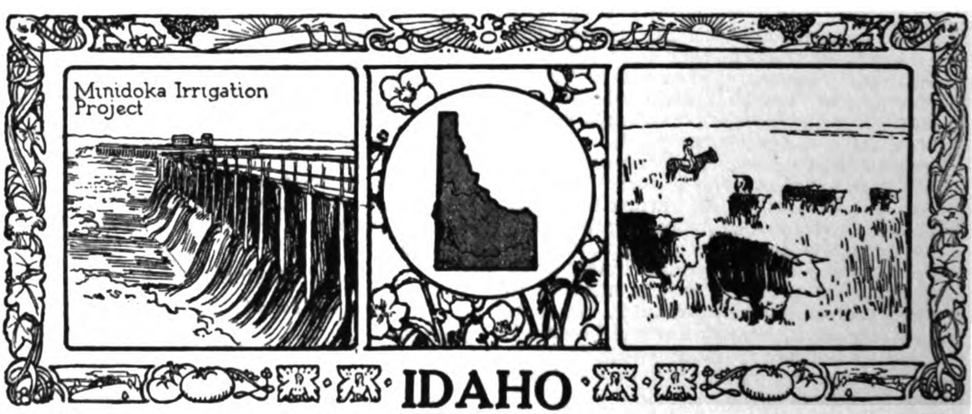
Per cent of farms run by tenants		65.6
" " " " " managers		.5

2. Crop Acreage, Yields, Values, 1910 and *1917*

Value all crops		$226,595,436
Value all cereals		42,405,019
Corn, acres	3,383,061;	*4,500,000*
bushels	39,374,569;	*72,000,000*
value	$37,079,981;	*$115,200,000*
av. yield per acre (10 years), bushels		14.4
Oats, acres	411,664;	*650,000*
bushels	6,199,243;	*10,400,000*
value	$4,236,625;	*$12,168,000*
av. yield per acre (10 years), bushels		19.4
Wheat, acres	93,065;	*244,000*
bushels	752,858;	*2,074,000*
value	$871,494;	*$6,015,000*
av. yield per acre (10 years), bushels		10.7
Value of other grains and seeds		$3,716,204
Rye, acres	12,352; bushels,	59,937
	15,000; "	*128,000*
Rice, acres	6,445; "	148,698
	900; "	*27,000*
Peanuts, acres	160,317; "	2,569,787
	255,000; "	*9,435,000*
Dry peas, acres	210,315; "	736,009
Hay and forage, value		$4,056,907
acres		253,157
tons		261,333
Value vegetables		$10,614,601
Value other crops		162,547,837
Cotton, acres	4,883,304;	*5,028,000*
bales	1,992,408;	*1,820,000*
value	$126,695,612;	*$262,080,000*
av. yield per acre (10 years), pounds		194
Sweet potatoes and yams, acres	84,038;	*$7,496,131*
bushels	125,000;	*11,625,000*
value		*$12,206,000*
Sugar cane, acres	37,046;	tons, 317,460
Sirup made, gallons		5,533,520
Sorghum cane, acres	15,612;	tons, 64,336
Sirup made, gallons		740,450
Value fruits and nuts		$3,254,868
Apples, trees	1,878,209; bushels,	895,613
		1,754,000
Peaches and nectarines, trees	10,609,119; "	2,555,499
		4,716,000
Pears, trees	262,982; "	149,667
		140,000
Grapes, vines	277,658; pounds,	2,767,366
Pecans, trees	75,519; "	354,046
Figs, trees	49,429; "	1,183,494
Strawberries, acres	890; quarts,	1,157,472

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		275,394
Value of domestic animals		$78,118,098
Cattle, number	1,080,316; value,	14,060,958
	1,104,000; "	*$26,579,000*
Dairy cows, number	405,710;	
	418,000; "	*15,466,000*
Horses, number	120,067; "	14,193,839
	127,000; "	*16,383,000*
Mules, number	295,348; "	43,974,611
	324,000; "	*52,812,000*
Swine, number	1,783,684; "	5,429,016
	2,585,000; "	*23,265,000*
Sheep, number	1 7,644; "	308,212
	150,000; "	*420,000*
Goats, number	89,616; "	70,059
Poultry, number	5,328,584; "	2,088,653
Bees, colonies	130,549; "	187,242
Milk produced, gallons		74,908,776
Butter produced, pounds		27,246,247
Value dairy products		$6,621,585
Value poultry products		7,077,449
Value animals sold		5,459,350
Value animals slaughtered		10,410,370



IDAHO ("Gem of the Mountains"), one of the Western Mountain States, lies between 42 and 49 degrees north latitude, and 111 and 118 degrees west longitude. It is irregular in shape, ranging in width from 50 to nearly 300 miles, with an extreme length of 485 miles. Area, 84,313 square miles, 534 of which are water.

Land surface. Idaho lies west of the Rocky Mountain divide, and is cut up by several minor ranges so that its varied surface includes mountains, fertile valleys and arid deserts. The altitudes vary from 783 feet at Lewiston on the west central boundary, to 12,078 feet at the top of Hyndman Peak on the east. The extreme southeast portion lies in the Great Salt Lake Basin. The remainder is drained by the Pend Oreille, Kootenai, Spokane and Snake Rivers and their tributaries of the Pacific slope. These all find their way to the Columbia River. Southeast of the center is a region, equal to Vermont in

size, drained by streams having no visible outlet. In the north and central portions are extensive forests.

Soils. Generally speaking, the soils are sand and silt loams of volcanic origin, in some sections, as in the broad Snake River Valley, lying undisturbed as when first deposited; in other sections, as on the Palouse and Nezperce prairies, they have been windblown, forming a peculiar hummocky topography. One prominent glaciated area in the northwest extends into Washington; this has a gravelly silt loam from 1 to 3 or 4 feet in depth strewn with boulders. In the river valleys is more or less alluvial soil, and the soil of the mountain meadows may, in many cases, be characterized by the same term. The sagebrush soils, as a rule, have great depth, are easily cultivated and, when put under irrigation and improved by the growth of alfalfa to improve their organic content, are highly productive. The open prairie soils, in more or less restricted areas in the south, and in vast expanses in the north, are of remarkable fertility from the time they are first brought under cultivation. The timbered soils are lighter than the preceding, but become highly productive when improved.

Climate. The climate is generally mild but varies widely. As a whole, it is influenced by the winds from the Pacific. The average annual temperature is reported as varying 15 degrees in a single county. In some parts in the south, flowers bloom outdoors in January. Lowest recorded temperature is 41 degrees below zero at Lost River, in February. The highest is 113 degrees at Garnet and Payette in July and August. Average annual temperatures range from 36.2 at Lake to 55.3 at Garnet. Temperatures are influenced not only by altitude but by the position of protecting mountains, by prevailing winds, and by the location of protected areas, air drainage on slopes and other natural features. Rainfall also varies widely. In the Pan Handle section, it ranges from 12 to 36 inches, but over much of the south, rainfall is so light that irrigation is generally necessary. The average annual rainfall for the state is only 13.2 inches, but the heavy snowfall upon the mountains furnishes abundant water for irrigation.

Opportunities. Idaho teems with agricultural opportunities. Lands of any required acreage in the raw condition, partially improved or highly improved, can be obtained at very reasonable prices. Livestock interests have an enormous asset in the national forests, where grazing lands are available at a nominal rental. Vast areas of public land are available for homestead or other entry, much capable of being developed into first-class farm lands, both irrigated and dry-farmed. The entryman may now file on 320 acres of land capable of being dry-farmed. Where conditions are otherwise favorable, dry-farmed land can be cultivated profitably with an annual rainfall as low as 12 inches. Approximately one half the land now under cultivation is being farmed by irrigation. There are two National reclamation projects within the state besides numerous other projects. Complete information relative to public land open to entry may be obtained from the land offices at Blackfoot, Boise, Hailey, Coeur d'Alene and Lewiston.

Products and industries. Leading farm activities are the raising of livestock (largely sheep), grain and all the orchard and horticultural products of the temperate zone. Wheat, oats, and barley are the leading grains. Apples, plums, peaches, pears, cherries and apricots grow to perfection, as do grapes and all small fruits. Fisheries are unimportant. Lumbering is an important industry. National Forest Reserves cover about 18,000,000 acres. Idaho has immense deposits of gold, silver, lead and copper, including the richest silver and lead mines known. Manufactures are increasing, lumbering, milling, cars and shop construction and printing and publishing being important.

Transportation and markets. The central part is not well supplied with railroads. River and lake communication is important locally. Leading market towns are Bonners Ferry, Sandpoint, Coeur d'Alene, St. Maries, Moscow, Lewiston, Payette, Weisen, Caldwell, Nampa, Boise, Twin Falls, American Falls, Shoshone, Idaho Falls, Blackfoot, St. Anthony, Ashton, Montpelier.

History. This begins with the explorations of Lewis and Clark in 1804–6. Idaho Territory first included Montana, which was separated in 1864, and Wyoming, separated in 1869. Gold discovered at Coeur d'Alene 1882. Admitted as a state in 1890. Capital, Boise; population, 1910, 28,000. Leading cities, Boise, Idaho Falls, Pocatello, Twin Falls, Moscow, Lewiston, Sandpoint.

Agricultural organization. College of Agriculture and Experiment Station, *Moscow;* Agricultural Extension and Coöperative Demonstration Work, Bureau of Farm Markets, *Boise.* Besides there are the State Horticultural Association, Pure Seed Association, Northwest Livestock Association. The State Fair is held at *Boise;* the Northwest Livestock Show at *Lewiston.*

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	325,594; *161,772*
White	319,221
Indian	3,488
Other non-white	2,885
(City, 69,898; country, 255,696)	
Number farmers	30,807; *17,471*
(White, 30,402; non-white, 405)	
Land area, acres	53,346,560
Acres in farms	5,283,604; *3,204,903*
Acres farm land improved	2,778,740; *1,413,118*
Average acres per farm	171.5 (90.2 acres improved)

Farms by size:	
100 to 174 acres	11,891
50 " 99 "	5,820
20 " 49 "	4,048
260 " 499 "	3,347
175 " 259 "	2,519
Value farm property	$305,317,185; *67,871,802*
Per cent increase in 10 years	353.9
" value farm property in land	72.0
" " " " " buildings	8.2
" " " " " stock and tools	19.7
Average value all property per farm	$9,911
Average value all land per acre	$41.63; *$11.07*
Per cent of farms run by owners and managers	89.7
" " " " " tenants	10.3

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$34,357,851
Value all cereals			16,026,676
Oats, acres	302,783;		*275,000*
bushels	11,328,106;		*10,450,000*
value	$5,158,000;		*$8,046,000*
av. yield per acre (10 years), bushels			45.1
Wheat, acres	399,234;		*685,000*
bushels	10,237,609;		*13,830,000*
value	$7,674,000;		*$25,171,000*
av. yield per acre (10 years), bushels			26.9
Barley, acres	132,412;		*190,000*
bushels	4,598,292;		*5,510,000*
value	$1,072,000;		*$5,786,000*
av. yield per acre (10 years), bushels			40.4
Value other grains and seeds			$263,875
Corn, acres	9,194;	bushels,	318,181
	22,000;	"	*682,000*
Rye, acres	3,295;	"	40,241
	2,000;	"	*31,000*
Dry edible beans, acres	1,915;	"	33,816
	18,000;	"	*99,000*
Hay and forage, value			$12,099,963
acres			732,886
tons			1,584,365
Value vegetables			$2,591,199
Value other crops			2,292,087
Potatoes, acres	28,341;	bushels,	4,710,262
	39,000;	"	*6,084,000*
Sugar beets, acres	15,601;	tons,	179,661
Value fruits and nuts			$1,084,051
Apples, trees	1,005,668;	bushels,	659,959
			1,995,000
Plums and prunes, trees	302,855;	"	179,027
Peaches and nectarines, trees	73,080;	"	18,734
			165,000
Pears, trees	65,113;	"	42,649
			70,000
Cherries, trees	61,881;	"	22,609
Grapes, vines	68,264;	pounds,	604,227
Small fruits, acres	1,673;	quarts,	2,071,141

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			28,534
Value of domestic animals			$49,076,971
Cattle, number	453,807;	value,	11,330,639
	548,000;	"	*24,390,000*
Dairy cows, number	86,299		
	130,000;	"	*8,255,000*
Horses, number	197,772;	"	19,832,423
	239,000;	"	*22,227,000*
Mules, number	4,036;	"	481,301
	4,000;	"	*400,000*
Swine, number	178,346;	"	1,398,727
	292,000;	"	*3,037,000*
Sheep, number	3,010,478;	"	15,897,192
	3,195,000;	"	*26,199,000*
Goats, number	5,719;	"	36,697
Poultry, number	1,053,876;	"	598,190
Bees, colonies	21,903;	"	100,148
Milk produced, gallons			20,861,072
Butter produced, pounds			3,542,135
Value dairy products			$1,962,500
Value poultry products			1,842,394
Value animals sold			11,791,655
Value animals slaughtered			1,074,048

4. Irrigation, 1909 and *1899*

Number farms irrigated			16,439; *9,188*
Per cent of all farms irrigated			53.4
Acreage irrigated			1,430,848; *608,718*
Types of projects and acreages:			
U. S. Reclamation Service	47,500	acres;	3.3%
U. S. Indian Service	3,426	"	0.2%
Carey Act Enterprises	162,418	"	11.4%
Irrigation Districts	140,930	"	9.8%
Coöperative Enterprises	628,102	"	43.9%
Commercial Enterprises	44,872	"	3.1%
Individual and Partnership Enterprises	403,600;	"	28.2%

Per cent of crops grown under irrigation:
Corn, 22.2; oats, 48.8; wheat, 26.8; emmer and spelt, 8.1; barley, 10; rye, 11.1; alfalfa seed, 56.7; clover seed, 75.1; timothy seed, 14.3; dry edible beans, 15.6; dry peas, 29.1; timothy, 24.2; timothy and clover, 61.9; clover, 79; alfalfa, 89.5; potatoes, 69.8; sugar beets, 86.4; small fruits, 62.3.

Yields	Irrigated	Non-irrigated
Oats, bushels	38.3	36.5
Wheat, bushels	26.8	25.2
Barley, bushels	32.3	35.0
Timothy, tons	1.91	1.19
Alfalfa, tons	3.27	1.80
Potatoes, bushels	179.9	134.5

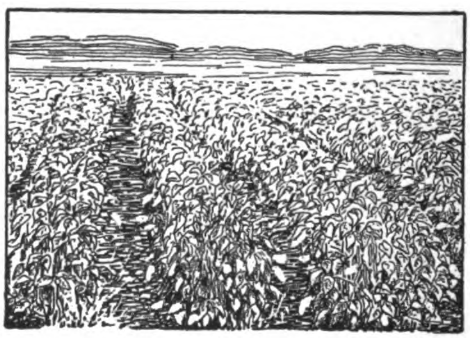


FIG. 372.—A field of soy beans grown for seed

ILLINOIS

ILLINOIS ("Prairie State"), one of the North Central Corn Belt States, situated between 36 and 44 degrees north latitude, and 87 and 92 degrees west longitude. The Mississippi River forms the entire western boundary, the Wabash and Ohio Rivers the southern, and Lake Michigan the northeastern. Area, 56,665 square miles, 663 of which are water. Its extreme length is 385 miles and its extreme width 218 miles.

Land surface. Illinois is 267 feet above sea level in the southern part at the junction of the Ohio and Mississippi Rivers, gradually rising with an undulating surface to slightly more than 1,000 feet at several points in the northwest. Most of the state has an elevation of 400 to 600 feet. One considerable elevation extends from the northwest corner southeast to the Illinois River; another crosses the state from east to west just south of parallel 38 degrees north latitude. The drainage is mostly to the Mississippi River. The Illinois, the largest river within the state, flows into the Mississippi and connects with the Chicago River and Lake Michigan by the Illinois and Michigan canal. It has several tributary rivers, as has the Ohio in the south. Large areas along the Mississippi and Ohio Rivers are subject to overflow.

Soils. The soils are largely of glacial origin, except in the lower river valleys, which are water-formed. In the west and west central part of the state, this glaciated upland is covered by a deep layer of brown or yellow silty loam known as the loess. The southeastern portion is chiefly occupied by a shallow covering of loess-like material, gray or ash-colored, compact and dense, differing in this respect from the brown or yellow, well-drained and friable loess of the deeper areas. In the east central and northern portion are brown to almost black loams and silty loams, except in the depressed areas. All are well suited to all the staple crops of the climate, though many of them require drainage.

Climate. The temperatures vary considerably between the more elevated northwest and the southern part. Highest and lowest recorded temperatures in the north are 112 degrees above and 32 degrees below zero; average annual temperature 48.7 degrees. The average frost-free season is 162 days; average annual rainfall 34 inches; and annual snowfall 31.5 inches. In the central section, highest and lowest recorded temperatures are 112 degrees and 30 degrees below zero; average annual temperature is 52 degrees; average frost-free season 170 days; average annual rainfall 35.66 inches; snowfall 23.5 inches. In the south, highest and lowest recorded temperatures are 113 degrees and 25 degrees below zero; average annual temperature, 55.8 degrees. In the extreme south, 16 degrees below zero has been recorded, but the frost-free season averages 185 days; average annual rainfall, 40.47 inches and snowfall 16.2 inches. Northern Illinois lies within the principal storm tracks that cross the country, hence is subject to sudden and decided changes in weather conditions and temperature, especially in winter.

Opportunities. Prices for desirable land are high, and little if any public land is left. Information may be obtained from the Experiment Station, Urbana, or the Board of Agriculture, Springfield.

Products and industries. Leading farm activities are the production of corn (in which Illinois has led all the states for many years), oats, wheat, and other grains, hay and forage, and livestock (especially beef cattle, horses and swine, and dairy cows, sheep and mules in considerable numbers). River and lake fisheries are considerable. Soft coal is the leading mineral, its area of production being the largest of any state, and covering more than one half the counties. Limestone and clay products are also important. In manufactures, Illinois leads all states west of the Alleghenies, and is exceeded by only two of

the 48 states. The leading industry of this type is slaughtering and meat packing, in which the manufacture of the by-products is extensive. Other important manufactured products include foundry and machine-shop products, agricultural implements and vehicles, automobiles; until about 1917 large amounts of distilled liquors; clothing; flour and by-products; glucose; electrical supplies; furniture and other timber products; boots and shoes. Chicago is the chief manufacturing city, most of the slaughtering and packing, as well as many other lines, centering there.

Transportation and markets. Illinois is admirably located for securing transportation facilities in every direction. The water communication over Lake Michigan and the Ohio and Mississippi Rivers is unexcelled for an inland state. Railway communication is unexcelled by that of any other state, including either main lines or important branches of about every leading railroad. Chicago, the only port of entry, ranks first among lake ports in domestic commerce, fourth in foreign commerce and is the leading market city.

History. First explored by La Salle from the Chicago to the Illinois Rivers in 1671. By 1750, the French had established a number of important trading settlements. Ceded to English by treaty of 1763. Formally ceded to the United States in 1783. After 1787, formed part of the Northwest Territory. Organized as a territory in 1809; admitted to statehood in 1819.

Agricultural organization. College of Agriculture and Experiment Station, Coöperative Demonstration Work, *Urbana*. Department of Agriculture, with Director and 9 bureaus, *Springfield*. There are a State Horticultural Society, Illinois Farmers' Institute, State Dairymen's Association, Live Stock Breeders' Association, Illinois Poultry Association, Beekeepers' Association, Illinois Agricultural Press Association, Highway Commission, Horse Breeders' Association, Cattle Breeders' Association, Swine Breeders' Association, Sheep Breeders' Association and others. The State Fair is held at *Springfield*.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	5,638,591; *4,821,550*
White	5,526,962
Colored	109,049
Other non-white	2,580
(City, 3,476,929; country, 2,161,662)	
Number farmers	251,872; *264,151*
(White, 250;447; non-white, 1,425)	
Land area acres	35,867,520
Acres in farms	32,522,937; *32,794,728*
Acres farm land improved	28,048,323; *27,699,219*
Average acres per farm	129.1 (111.4 acres improved)
Farms by size:	
100 to 174 acres	80,539
50 " 99 "	57,917
Farms by size (*continued*):	
175 to 259 acres	38,315
20 " 49 "	33,322
260 " 499 "	19,440
10 " 19 "	10,258
Value farm property	$3,905,321,075; *$2,004,316,897*
Per cent increase in 10 years	94.8
" value of farm property in land	79.1
" " " " " " buildings	11.1
" " " " " " stock and tools	9.8
Average value all property per farm	$15,505
Average value land per acre	$95.02; *$46.17*
Per cent of farms run by owners and managers	58.5
" " " " " tenants	41.4

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$372,270,470
Value all cereals		297,523,098
Corn, acres	10,045,839;	*11,000,000*
bushels	390,218,676;	*418,000,000*
value	$157,629,000;	*$459,800,000*
av. yield per acre (10 years), bushels		33.7
Oats, acres	4,176,485;	*4,700,000*
bushels	150,386,074;	*244,400,000*
value	$51,300,000;	*$158,860,000*
av. yield per acre (10 years), bushels		33.1
Wheat, acres	2,185,091;	*1,600,000*
bushels	37,830,732;	*30,400,000*
value	$27,720,000;	*$61,104,000*
av. yield per acre (10 years), bushels		15.5
Barley, acres	63,325;	*66,000*
bushels	1,613,559;	*2,475,000*
value	$630,000,000;	*$2,995,000*
Average yield per acre (10 years), bushels		29.6
Value other grains and seeds		$2,255,393
Hay and forage value		$40,560,220
acres		3,349,435
tons		4,354,466
Value vegetables		16,300,654
Value other crops		10,216,511
Potatoes, acres	138,052; bushels,	12,166,091
	150,000; "	*13,500,000*
Sweet potatoes and yams, acres	10,568; "	1,050,932
	8,000; "	*776,000*
Broom corn, acres	38,452; pounds,	19,309,425
Value fruits and nuts		$5,414,594
Apples, trees	9,900,627; bushels,	3,093,321
		7,500,000
Peaches, trees	2,860,120; "	1,222,570
		364,000
Pears, trees	786,349; "	249,365
		456,000
Cherries, trees	843,283; "	287,376
Plums and prunes, trees	600,087; "	78,566
Grapes, vines	2,170,340; pounds,	16,582,785
Small fruits, acres	11,723; quarts,	13,602,676

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		246,353
Value of domestic animals		$296,619,153
Cattle, number	2,440,577; value,	$ 73,454,745
	2,308,000; "	*126,044,000*
Dairy cows, number	1,050,223; "	
	1,057,000; "	*71,876,000*
Horses, number	1,452,887; "	163,363,400
	1,452,000; "	*153,912,000*
Mules, number	147,833; "	18,140,335
	150,000; "	*17,250,000*
Swine, number	4,686,362; "	36,210,179
	4,444,000; "	*60,883,000*
Sheep, number	1,059,846; "	4,843,736
	898,000; "	*7,364,000*
Poultry, number	21,409,835; "	11,696,650
Bees, colonies	155,846; "	487,733
Milk produced, gallons		320,240,399
Butter produced, pounds		46,609,992
Value dairy products		$31,542,209
Value poultry products		32,282,613
Value animals sold		132,622,547
Value animals slaughtered		14,438,127

INDIANA

INDIANA ("Hoosier State"), one of the north central Corn-Belt States, lying between 37 and 44 degrees north latitude, and 84 and 89 degrees west longitude. Area, 36,354 square miles, of which 469 are water.

Land surface. Indiana lies partly in the Mississippi Valley and partly in the Great Lakes Basin. In general, the gently rolling surface slopes toward the southwest, where the lowest elevation (370 feet) is found. The highest land is in the northeast and along the east central border, and the highest point (1,208 feet) at Carlos City. The Wabash River and its tributaries rising in Ohio and reaching the Ohio River on the southwestern boundary, drain a large part of the state. The southern part drains directly into the Ohio River, the northwestern into Lake Michigan, and the northeastern into Lake Erie. The region along Lake Michigan is low and some of it swampy. Along the Ohio and lower Wabash Rivers, the land is subject to overflow. The country toward the south abounds in isolated hills, narrow valleys and precipitous cliffs. A large part of the central part is typical prairie.

Soils. Except in the south, these are largely alluvial of glacial origin. The loams are brown, gray and black. In the northwest, is an extensive level area formerly marshy but now drained, on which the soils are largely black, sandy loams and mucks. In the "hill region" in the south, there is more clay and the soil is not so fertile, but suited for general farm crops, orchards and livestock. In the lower river valleys are alluvial soils.

Climate. In general, this is mild and even. Cold winds from the lake region cause sudden changes in the north at times. Average annual temperature in the north is about 50 to 52 degrees; in the south, 54. Highest recorded temperature is 111 degrees at several different stations. The lowest is 33 degrees below zero, an exceptional record. The average frost-free season is about 160 days. Northern Indiana is subject to severe winter storms which sweep across the state. Average annual rainfall in the northern section is 36 inches; in the south somewhat more—from 37 to 55 inches, one station recording 55 inches. Average annual snowfall varies from 12 inches in the southwest to about 40 inches in the north.

Opportunities. Fertile soils throughout most of the state, adaptable to all farm and orchard products, a congenial climate, abundant rainfall, good transportation facilities, make the state an excellent one for the farmer. No abandoned farms are reported.

Products and industries. "Corn is King," exceeding in value all other cereals. Wheat, oats, hay and forage, potatoes, and tobacco are the leading farm crops, though all staple crops are produced to some extent. Fruit growing is extensive, apples and peaches being the leading tree fruits, grapes and small fruits being largely grown. Trucking is an extensive industry on the drained swamps in the northwest. Melon growing is important in several sections, while Indiana claims to lead in the production of tomatoes, largely for canning. Livestock is very important, hogs leading in number followed by cattle, sheep and horses. In value, horses rank first, cattle, hogs, mules and sheep following in order. Dairying is extensive, both for milk for city markets and for the manufacture of butter, cheese, ice cream and evaporated and condensed milk. Poultry exceed sheep in value, the state ranking high in this industry. Limited fisheries are carried on in Lake Michigan and the Ohio River and its tributaries, more than half the value being obtained from mussels. Lumbering has declined, oak being the principal timber at present. Coal and petroleum are the leading minerals, and the state is famous for its Bedford stone, one of the finest building stones for all purposes. Manufactures are

extensive and valuable. Leading ones are meat products, flour and grist-mill products, steel, automobiles, rubber goods, carriages and wagons, furniture, agricultural implements, railroad cars, canned goods, clothing, electrical supplies, cement, dairy products.

Transportation and markets. Transportation facilities are unexcelled, especially by railways, practically all transcontinental lines crossing the state. Indianapolis is a great railroad center for lines extending in all directions. Indiana ranks second in mileage of electric railways, and claims to be first in service to farms and factories. Many of these are interstate lines. The state also claims a greater mileage of improved highways than any other state. Water communication to the north and east is furnished by Lake Michigan on the north, and to the Mississippi Valley and the Gulf of Mexico by the Ohio River and its tributaries. Evansville and Indianapolis are ports of entry and good markets. Other market towns in the State are New Albany, Fort Wayne, South Bend, Terre Haute, Hammond, Gary, Michigan City. Other large city markets easily accessible are Chicago, Cincinnati, Louisville, St. Louis and others more distant.

History. First explorer, La Salle, 1679–80; the French erected a fort at Vincennes 1702 and made first permanent settlement shortly after. The English occupied the territory in 1763. Ceded to the United States 1783, became part of Northwest Territory 1787. This Territory was divided in 1800, and after various other divisions and changes, the present limits were established about 1809. Admitted to the Union 1816. Capital, Indianapolis; population, 1910, 233,650.

Agricultural organization. Agricultural College and Experiment Station, parts of Purdue University, and Coöperative Demonstration work, *Lafayette*. Board of Agriculture, *Kentland;* Swine Breeders' Association, *Union City;* Sheep Breeders' and Feeders' Association, *Indianapolis;* Corn Growers' Association, Livestock Breeders' Association, Cattle Feeders' Association, Dairy Association, Horticultural Society, Draft Horse Breeders' Association, Federation Associations, Stallion Registration Board, all *Lafayette*. The State Fair is held at *Indianapolis*.

Statistics

1. Farms and Farm Property, 1910 and *1917*

Population	2,700,876	*2,516,462*
White	2,639,961	
Colored	60,320	
Other non-white	595	
(City, 1,143,835; country, 1,557,041)		
Number farmers	215,485	*221,897*
(White, 214,680; non-white, 805)		
Land area, acres	23,068,800	
Acres in farms	21,299,823	*21,619,623*
Acres farm land improved	16,931,252	*16,680,358*
Average acres per farm	98.8 (78.6 acres improved)	

Farms by size:

50 to 99 acres	67,221
100 " 174 "	57,261
20 " 49 "	40,161
175 " 259 "	18,081
10 " 19 "	11,695
3 " 9 "	11,508

Value farm property	$1,809,135,238	*$978,616,471*
Per cent increase in 10 years	84.9	
" value of farm property in land	73.4	
" " " " " " buildings	14.7	
" " " " " " stock and tools	11.9	
Average value all property per farm	$8,396	
Average value land per acre	$62.36	*$31.81*
Per cent of farms run by owners and managers	70	
" " " " " tenants	30	

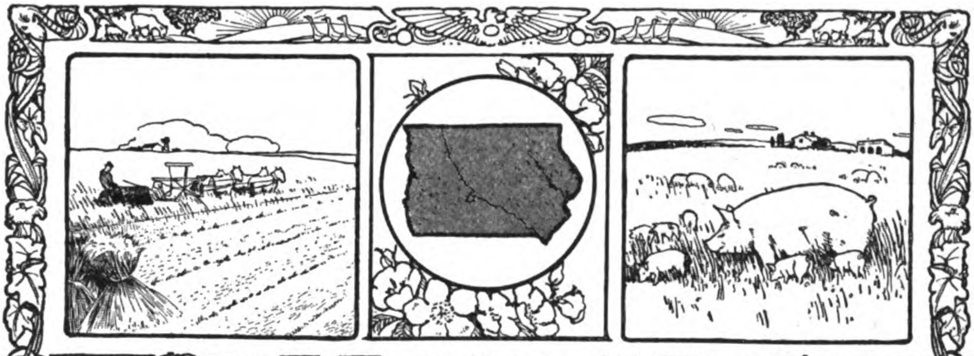
2. Crop Acreage, Yields, Values, 1910 and *1917*

Value all crops	$204,209,812	
Value all cereals	151,898,146	
Corn, acres	4,901,054	*5,651,000*
bushels	195,496,433	*203,436,000*
value	$80,486,000	*$254,295,000*
av. yield per acre (10 years), bushels	36.3	
Oats, acres	1,667,818	*1,820,000*
bushels	50,607,913	*76,440,000*
value	$20,302,000	*$48,157,000*
av. yield per acre (10 years), bushels	29.6	
Wheat, acres	2,082,835	*1,805,000*
bushels	33,935,972	*33,392,000*
value	$32,854,000	*$67,786,000*
av. yield per acre (10 years), bushels	15	
Barley, acres	10,188	*22,000*
bushels	234,298	*671,000*
value	$304,000	*$698,000*
av. yield per acre (10 years), bushels	25.5	
Rye, acres	83,440	*200,000*
bushels	1,121,589	*3,000,000*
value	$591,000	*$4,800,000*
av. yield per acre (10 years), bushels	15.4	
Hay and forage, value	$24,883,461	
acres	2,300,579	
tons	2,880,104	
Value vegetables	$11,454,036	
Value other crops	10,390,746	

Potatoes, acres	99,504;	bushels,	8,905,679
	92,000;	"	*8,464,000*
Tobacco, acres	23,694;	pounds,	21,387,824
Value fruits and nuts			$4,617,092
Apples, trees	5,764,821;	bushels,	2,759,134
		"	*5,915,000*
Peaches and nectarines, trees	2,130,298;	"	1,174,389
			592,000
Pears, trees	708,723;	"	319,925
			410,000
Plums and prunes, trees	566,988;	"	77,065
Cherries, trees	815,742;	"	363,993
Grapes, vines	1,049,232;	pounds,	12,817,353
Small fruits, acres	5,919;	quarts,	7,424,831

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			207,806
Value of domestic animals			$165,867,178
Cattle, number	1,363,016;	value,	$39,110,492
	1,441,000;	"	*69,966,000*
Dairy cows, number	633,591;		
	706,000;	"	*41,301,000*
Horses, number	813,644;	"	87,118,468
	845,000;	"	*91,260,000*
Mules, number	82,168;	"	9,678,014
	95,000;	"	*10,830,000*
Swine, number	3,613,906;	"	23,739,586
	3,970,000;	"	*45,655,000*
Sheep, number	1,336,967;	"	5,908,496
	1,005,000;	"	*8,241,000*
Poultry, number	13,789,109;	"	7,762,015
Bees, colonies	80,938;	"	230,478
Milk produced, gallons			194,736,962
Butter produced, pounds			43,181,817
Value dairy products			$16,666,374
Value poultry products			24,707,013
Value animals sold			81,437,250
Value animals slaughtered			11,458,882



IOWA

IOWA ("Hawkeye State"), one of the North Central States, situated between 40 and 44 degrees north latitude, and 89 and 97 degrees west longitude. The Mississippi River forms the eastern boundary, the Missouri and Big Sioux Rivers the western. Area, 56,025 square miles, of which 550 are water.

Land surface. The surface is largely a gently rolling prairie, nearly level and sloping gradually from the northwest (elevation of about 1,800 feet) to the southeast where, at Keokuk, the lowest elevation, 477 feet, is reached. The average elevation is somewhat more than 1,000 feet. About the only rough surface is that of the steep bluffs along the rivers. Two-thirds of the state drains into the Mississippi River, the remainder into the Missouri. The highland dividing the two river systems extends from a little west of the center of the southern boundary, irregularly north-northwest across the state. There are numerous small and beautiful lakes in the north central part of the state. There are no extensive forests, but some timber belts along the streams. The lowlands along the rivers are sometimes subject to overflow. Principal tributaries of the Mississippi River are the Des Moines, Iowa, Cedar, Wapsipinicon, and of the Missouri, Big Sioux and Little Sioux Rivers. It is said that 97 per cent of the land surface is tillable, though some of it needs draining.

Soils. The soil is largely of glacial origin but free from boulders, and remarkably fertile and easily worked. The prairie soil is a black loam of sand and clay. In the Mississippi and Missouri Valleys is found a layer of loess—a fine, yellowish sand and clay. The soil of the other river bottoms is alluvial.

Climate. The winters are moderately cold and the summers, while hot, are not usually extreme. The average annual temperature is about 47 degrees; the highest recorded temperature 112 degrees; the lowest, 36 degrees below zero. These extremes are unusual. The frost-free season is about 160 days, a little longer in the southwest. The average annual rainfall is about 33 inches, the precipitation being heaviest along the Mississippi River. The snowfall is comparatively light.

Opportunities. No public lands are available. The prices of farm lands range from $100 to $300 per acre, and there is very little land that can be bought for less than $100 per acre. Information may be obtained from the Agricultural Experiment Station, Ames.

Products and industries. Leading farm activities are the production of cereals, livestock and fruits of nearly all kinds. Iowa has led the states in the production of many farm crops. Corn is the leading cereal, followed by oats, wheat, barley, rye, buckwheat, flaxseed and others. It is among the leaders in livestock, and dairying is extensive all over the state. Great numbers of swine are raised, many horses, mules and sheep; poultry is a valuable product. It is said that no other state feeds so large a part of its grain products to its farm animals. Iowa abounded in native fruits and nuts, many of which have been bred and developed into valuable varieties. Most fruits succeed best in the southern part, the soil seeming to be more favorable. Apples are the leading fruit, followed by plums and prunes, cherries and grapes. Pears succeed in few localities. Peaches are grown in limited quantities in the southwest. Most small fruits succeed well everywhere, but require more care in the northern part. The only important mineral is coal, in the production of which Iowa ranks second among the states west of the Mississippi. Clay and clay products and limestone are valuable. Manufactures are not so important as in some other states, but are increasing and well distributed throughout the state. Most important of all are the slaughtering and meat-packing industries; next is factory-made butter, cheese and condensed milk, the larger part of the value of these being in butter; flouring; car con-

struction; carriages and wagons. There are no great manufacturing centers.

Transportation and markets. Iowa ranks high in railway mileage, 10,000 miles, and the state is well covered. Several of the great trunk lines cross it; connecting and local lines are numerous. Des Moines is the leading railroad center and an important market, as are Keokuk, Davenport, Dubuque, Sioux City, Cedar Rapids, Burlington, Council Bluffs. River communication is important on the Mississippi. There are, in round numbers, 100,000 miles of public highways, which are being uniformly graded, and many of them surfaced with gravel. The Lincoln Highway passes through the State from east to west, and the Jefferson Highway from north to south, intersecting about the middle of the state.

History. Named from the Iowa Indians, meaning beautiful land. From 1788 to 1810 the French had a trading and mining settlement at Dubuque. The region was ceded to the United States as part of Louisiana in 1803. Several settlements along the Mississippi made in 1833 and succeeding years. After being successively apportioned to the territories of Missouri, Michigan and Wisconsin, Iowa was organized as a separate territory in 1838, with the capital at Burlington. It embraced the greater part of the present state of Minnesota and all of the Dakotas. Admitted to the Union with its present boundaries in 1846. Des Moines became the capital 1857; population, 1910, 86,368.

Agricultural organization. Department of Agriculture, Des Moines. College of Agriculture and Mechanic Arts and Experiment Station, Coöperative Demonstration Work, Forestry and Conservation Association, *Ames.* Horticultural society, Society of Iowa Florists, Western Grain Dealers' Association, *Des Moines;* Iowa Corn and Small Grain Growers' Association, *Ames;* Corn Belt Meat Producers' Association, *Des Moines;* Beef Producers' Association, *Mt. Pleasant;* State Highway Association, *Ames;* Swine Breeders' Association, *Rolfe;* Dairy Association, Iowa Falls; Draft Horse Breeders' Association, *Des Moines;* Shorthorn Breeders' Association, *Marion;* Aberdeen-Angus Cattle Breeders' Association, *Newton;* Beekeepers' Association, *Center Point;* Poultry Association, *Cedar Rapids;* Fish and Game Protective Association, *Dubuque;* Sheep Breeders' Association, *Bloomfield;* Shropshire Breeders' Association, *Ames;* Meat Producers' Association, *Des Moines.* State Fair annually at *Des Moines.*

The 1917 Legislature appropriated $50,000 annually for soil survey work.

The Experiment Station Director reports that, although Iowa ranks fifteenth in population and twenty-third in area of land, she ranks first in total value of farm products, combined value of livestock, value of farm property per farm, increased value of farm property during decade ending 1910, percentage of farm land improved, percentage of total area in farms, number of automobiles per capita, value of horses, value of cattle, value of hogs, number of poultry, value of egg production, value of farm implements, tonnage of forage crops, production of corn, production of oats, and production of grass seed.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,224,771; *2,231,853*
White	2,209,191
Colored	14,973
Other non-white	607
(City, 680,054; country, 1,544,717)	
Number farmers	217,044; *228,622*
(White, 216,843; non-white, 201)	
Land area, acres	35,575,040
Acres in farms	33,930,688; *34,574,337*
Acres farm land improved	29,491,199; *29,897,552*
Average acres per farm	156.3 (135.9 acres improved)
Farms by size:	
100 to 174 acres	80,121
175 " 259 "	40,304
50 " 99 "	38,712
260 " 499 "	25,861
20 " 49 "	15,678
Value farm property	$3,745,860,544; *$1,834,345,546*
Per cent increase in 10 years	104.2
" value farm property in land	74.8
" " " " " buildings	12.2
" " " " " stock and tools	13.0
Average value all property per farm	$17,259
Average value land per acre	$82.58; *$36.35*
Per cent of farms run by owners	61.3
" " " " " tenants	37.8
" " " " " managers	0.9

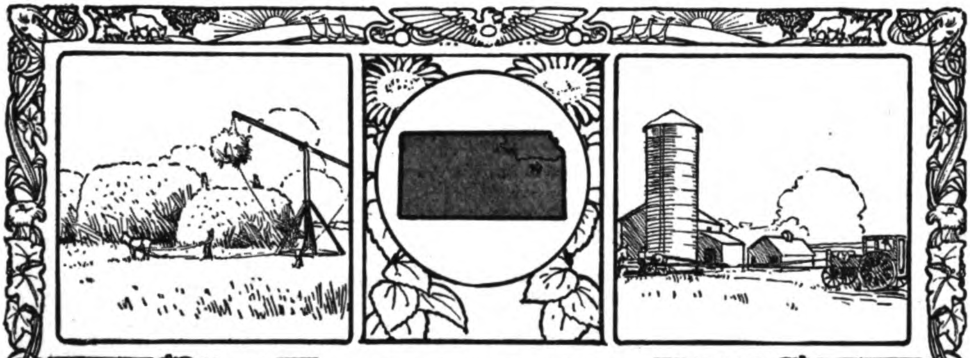
2. Crop Acreage, Yields, Values, 1910 and *1917*

Value all crops		$314,666,298
Value all cereals		230,205 315
Corn, acres	9,229,378;	*11,100,000*
bushels	341,750,460;	*410,700,000*
value	$123,793,000;	*$443,556,000*
av. yield per acre (10 years), bushels		34.2
Oats, acres	4,655,154;	*5,250,000*
bushels	128,198,055;	*246,750,000*
value	$48,989,000;	*$155,452,000*
av. yield per acre (10 years), bushels		32.8
Wheat, acres	526,777;	*420,000*
bushels	8,055,944;	*8,350,000*
value	$9,462,000;	*$16,616,000*
av. yield per acre (10 years), bushels		18.0
Barley, acres	571,224;	*300,000*
bushels	10,964,184;	*10,500,000*
value	$8,425,000;	*$12,285,000*
av. yield per acre (10 years), bushels		26.8
Rye, acres	42,042;	*50,000*
bushels	570,996;	*900,000*
value		*$1,395,000*
av. yield per acre (10 years), bushels		18.4
Flaxseed, acres	15,549;	*12,000*
bushels	140,906;	*132,000*
value		*$363,000*
Value other grains and seeds		$1,933,711
Hay and forage, value		$59,360,225
acres		5,046,185
tons		7,823,181
Value vegetables		$12,021,408
Value other crops		5,527,870
Potatoes, acres	169,567; bushels,	14,710,247
	138,000; "	*13,110,000*
Sweet potatoes, and yams, acres	2,274; "	232,413
Value fruits and nuts		$5,617,769
Apples, trees	5,847,034; bushels,	6,746,668
		5,775,000
Peaches, nectarines, trees	1,090,749; "	23,180
		30,000
Plums, prunes, trees	1,155,041; "	158,036
Cherries, trees	908,764; "	260,432

Grapes, vines	1,983,465;	pounds,	11,708,336
Small fruits, acres	7,211;	quarts,	10,344,052
Nuts, trees	163,337;	pounds,	1,721,265

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		213,131
Value of domestic animals		$380,201,586
Cattle, number	4,448,006; value,	$118,864,139
	4,159,000; "	*212,405,000*
Dairy cows, number	1,406,792;	
	1,405,000; "	*93,432,000*
Horses, number	1,492,226; "	177,999,124
	1,552,000; "	*166,064,000*
Mules, number	55,524; value	$7,551,818
	62,000; "	*7,192,000*
Swine, number	7,545,853; "	69,693,218
	9,370,000; "	*137,739,000*
Sheep, number	1,145,549; "	5,748,836
	1,240,000; "	*10,912,000*
Poultry, number	23,482,880; "	12,269,881
Bees, colonies	160,025; "	517,329
Milk produced, gallons		318,954,506
Butter produced, pounds		38,679,568
Value dairy products		$31,196,883
Value poultry products		31,270,571
Value animals sold		208,069,001
Value animals slaughtered		10,147,302



KANSAS

KANSAS ("Sunflower State"), a North Central State, is situated between 37 and 40 degrees north latitude, and 94 and 103 degrees west longitude. The northern part of the east boundary is the Missouri River. Area, 82,158 square miles, 384 of which are water.

Land surface. Kansas is a prairie state. Nearly the entire surface is an undulating plain which slopes gradually from nearly 4,000 feet elevation in the west to 750 to 1,000 feet in the east and south. High bluffs are found along many of the rivers, those along the Missouri being more than 200 feet. The Arkansas River drains the southern part; its chief branches are the Cimarron, Verdigris and Neosho. Chief branches of the Kansas in the north are Big Blue, Republican, Solomon and Smoky Hill. There are few forests, but tree planting has been done to some extent by the Federal Government.

Soils. These are chiefly silt loams. Those of the northeastern part have been formed by glacial action, and are quite fertile; those of the southeastern part are residual shale and sandstone and are not especially fertile; throughout the central and east central parts the soils are residual, chiefly from limestone, and quite productive; in the northwestern section they are of loessial formation, very high in plant food content but of limited productivity because of light rainfall. The soils of the southwestern corner (where the sand dunes are found) have been derived from outwash material from the Rocky Mountains. The quite extensive river bottom soils are mainly sandy loams and are decidedly fertile.

Climate. The average annual temperature for the state is 54 degrees. The winters are generally mild and the hottest summer days are tempered by cool evenings. Temperatures vary considerably from north to south, also because of altitude, from east to west. Highest recorded temperature for the north is 115 degrees at Manhattan; lowest, 36 degrees below zero at Superior. For the south, highest, 114 degrees at Winfield; lowest, 32 degrees below at Garden City. The extremes are rare. The frost-free season in the southeast is more than 200 days; in the northwest, 155 days. Rainfall has varied widely in different years, but the larger part usually falls during the growing season. It ranges from an average of 16 inches in the west to 44 inches in the east. Snowfall varies from 11 inches to 52 inches in different parts of the state, and also varies greatly from year to year. The state has suffered in some seasons from severe droughts. Tornadoes are not unknown, especially in the central and southern parts of the state; they usually cause but little destruction and affect only small territories.

Opportunities. Irrigation renders highly productive regions otherwise barren in the semi-arid western third of the state. So far, these are mainly in the Arkansas Valley, where an abundant supply of underground

water, available at depths varying from 20 to 150 feet, is being profitably brought to the surface by steam and electric pumps. There are also numerous flowing wells.

Products and industries. Leading farm activities are the production of cereals, hay and forage, vegetables, fruits and livestock. Corn is the leading crop in the east. Through the center of the state, from north to south, is the wheat belt; hard winter wheat, famous for its milling qualities, is largely grown. Oats, rye and barley are important crops in the north and east. Potatoes, sweet potatoes and other vegetables are successfully grown in the south and east. Broom corn, sorghum, millet, kafir and flax should also be mentioned. Alfalfa holds a high place among the forage crops, and sugar beet growing is important in the southwestern part. The western part is largely grazing country, although much former grazing land is gradually being brought under cultivation for wheat. Large numbers of range cattle are fattened further east in the alfalfa and corn country. Swine are produced in large numbers, and many horses and mules. Dairying is being extended, and poultry is important. Fruit growing is increasing; apples lead, being especially important in the northern and eastern sections. Pears, plums, peaches, and cherries also do well throughout most of the state. Grapes and small fruits thrive—many of the latter being native to the state. Leading minerals are coal, petroleum and natural gas, zinc, lead, limestone and salt. The manufactures are largely of agricultural products. Slaughtering and meat packing lead, followed by flouring, railroad-shop construction, zinc smelting, printing, and butter, cheese and condensed milk manufacturing.

Transportation and markets. Railway communication is exceptionally good in all directions. Several transcontinental lines give outlets east and west and others to the south and Gulf ports. The Missouri River on the northeast furnishes the only water communication. Kansas City is the leading market and largest city; population, 1910, 82,331.

History. Named for the Kansas Indians. Coronado, a Spanish explorer, first visited the region in 1541, and the French explored it in 1719. The Lewis and Clark expedition traversed the state in 1804. A military post was established at Fort Leavenworth in 1827. Kansas was set off from Missouri territory in 1854. After a long and bitter struggle between anti-slavery and pro-slavery forces, Kansas was admitted as a free state in 1861. Capital, Topeka; population, 1910, 46,747.

Agricultural organization. College of Agriculture and Experiment Station, *Manhattan;* Branch Stations, *Tribune, Fort Hays, Garden City.* Coöperative Demonstration Work, *Hays, Parsons, Dodge City, Norton.* There are a State Grange, Farmers' Union, Board of Agriculture, Horticultural Society, Improved Stock Breeders' Association, Dairy Association, State Fair Association, Stallion Registration Board.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,690,949;	*1,470,495*
White	1,634,352	
Cclored	54,030	
Other non-white	2,567	
(City, 493,790; country, 1,197,159)		
Number farmers	177,841;	*173,098*
(White, 176,150; non-white, 1,691)		
Land area, acres		52,335,360
Acres in farms	43,384,799;	*41,662,970*
Acres farm land improved	29,904,067;	*25,040,550*
Average acres per farm	244 (168.2 acres improved)	
Farms by size:		
100 to 174 acres		57,789
260 “ 499 “		34,696
175 “ 259 “		26,590
50 “ 99 “		26,151
20 “ 49 “		10,738
500 “ 999 “		10,475
Value farm property	$2,039,389,910;	*$864,100,286*
Per cent increase in 10 years		136.0
“ value of farm property in land		75.4
“ “ “ “ “ “ buildings		9.8
“ “ “ “ “ “ stock and tools		14.8
Average value all property per farm		$11,467
Average value land per acre	$35.45;	*$12.77*
Per cent of farms run by owners		62.5
“ “ “ “ “ tenants		36.8
“ “ “ “ “ managers		0.8

2. Crop Acreage, Yields, Values, 1910 and *1917*

Value all crops			$214,859,597
Value all cereals			169,109,449
Corn, acres	8,109,061;		*9,156,000*
bushels	154,651,703;		*128,184,000*
value	$76,095,000;		*$60,230,000*
av. yield per acre (10 years), bushels			18.3
Wheat, acres	5,973,785;		*3,757,000*
bushels	77,577,155;		*45,934,000*
value	$52,137,000;		*$90,950,000*
av. yield per acre (10 years), bushels			13.7
Oats, acres	933,309;		*2,284,000*
bushels	22,923,641;		*70,804,000*
value	15,851,000;		*$45,315,000*
av. yield per acre (10 years), bushels			24.8
Barley, acres	166,115;		*750,000*
bushels	2,221,816;		*7,500,000*
value			*$8,625,000*
Value other grains and seeds			1,565,264
Hay and forage, value			$32,033,954
acres			3,957,745
tons			5,936,997
Value vegetables			6,808,653
Broom corn, acres	41,064;	pounds,	8,768,853
	60,000;	“	*24,000,000*
Potatoes, acres	79,025;	bushels,	5,647,049
	78,000;	“	*4,446,000*
Sweet potatoes, acres	4,883;	“	558,021
	4,000;	“	*368,000*
Sorghum cane, acres	15,406;	tons,	60,821
Sirup, gallons			260,680
Value other crops			$3,751,100
Kafir corn and milo maize, acres	388,495;	bushels,	5,115,415
	2,126,000;	“	*31,890,000*
Flax seed, acres	45,014;	“	302,491
Value fruit and nuts			$1,591,177
Apples, trees	6,929,673;	bushels,	1,356,438
			3,375,000
Peaches, nectarines, trees	4,394,894;	“	24,567
			121,000
Pears, trees	292,383;	“	19,412
			140,000
Plums, prunes, trees	624,648;	“	12,250
Cherries, trees	661,267;	“	34,409
Grapes, vines	2,889,845;	pounds,	6,317,684
Small fruits, acres	5,400;	quarts,	5,477,274

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			173,491
Value of domestic animals			$245,926,421
Cattle, number	3,079,403;	value,	$80,557,443
	3,015,000;	“	*149,206,000*

Dairy cows, number....	736,107; value,	
	900,000; "	*$58,050,000*
Horses, number........	1,147,056; "	112,758,180
	1,120,000; "	*110,880,000*
Mules, number........	208,409; "	25,629,418
	265,000; "	*28,620,000*
Swine, number........	3,000,157; "	$24,706,885
	2,535,000; "	*31,180,000*
Sheep, number........	272,475; "	1,209,931
	348,000; "	*2,645,000*
Poultry, number.........	15,736,038; "	7,377,469
Bees, colonies...........	73,737; "	218,612
Milk produced, gallons		172,742,767

Butter produced, pounds	29,647,881
Value dairy products	$13,091,739
Value poultry products	21,525,930
Value animals sold	130,736,764
Value animals slaughtered	7,186,488

4. Irrigation, 1909 and *1900*

Number farms irrigated	1,006; *929*
Per cent of all farms irrigated	0.6; *0.5*
Acreage irrigated	37,479; *23,620*
Types of project and acreages:	
U. S. Reclamation Service	6,953
Coöperative enterprises	27,372
Individual and partnership enterprises	2,154

KENTUCKY

KENTUCKY ("Blue Grass State"), one of the South Central States, is situated between 36 and 40 degrees north latitude, and 82 and 90 degrees west longitude. Its boundaries are largely rivers, the Ohio and Big Sandy forming the northern boundary and the Mississippi the southwestern. Area, 40,598 square miles, of which 417 are water.

Land surface. Kentucky has a greatly diversified surface. There are 5 well-defined regions, each differing in elevation, soil and climate. The mountainous section of the southwest has some elevations of 3,000 feet; in the eastern and southeastern part is the plateau region with elevations of 1,000 to 1,500 feet; in the northeast is the "Blue Grass Region" of gently rolling land with an elevation of about 1,000 feet; low foot-hills in the south have an elevation of 400 to 600 feet; high plateaus and hill country in the north reach from 600 to 1,200 feet. The state drains into the Mississippi River which flows for a distance along the southwestern boundary. The general slope is towards the west and northwest. It has numerous natural caverns or caves, the best-known of which is the well-known Mammoth Cave.

Soils. The soil is largely limestone; that of the northwest is a mixture of limestone and sandstone which somewhat lessens its fertility. In the south and west are some clay soils and along the rivers typical alluvial formations. Much of the loamy limestone soil is underlaid with clay. A large part of the state is well fitted for diversified agriculture, some of it for special crops.

Climate. The average annual temperature varies from about 50 degrees in the Cumberland Mountains in the southeast to 60 degrees along the Mississippi in the southwest. The climate generally is mild. Highest recorded temperature in the east is 108 degrees at Lexington and Maysville; lowest 28 degrees below zero at Shelby City. In the western section, the highest temperature was 112 degrees at Paducah; lowest 30 below zero at Loretto. The average frost-free season in western Kentucky is 180 days; in the eastern part a little less. Average rainfall of the state 44 inches, heaviest in the Cumberland River basin, lightest in the Licking River basin. The state is within the normal storm tracks from the southwest, and rainfall is generally well distributed, the least being in September and October.

Opportunities. Information about agricultural opportunities may be obtained from the Agricultural Experiment Station, Lexington.

Products and industries. Leading farm activities are the production of cereals, tobacco, fruits, livestock and a variety of miscellaneous crops. Corn is the leading grain; others in order are wheat, oats and rye. Great quantities of hay are produced, and this with the corn and oats contributes to a large production of fine horses, in which line the state has long been a leader. Their value far exceeds that of any other livestock. Tobacco is large-

ly grown in the western central part along the rivers, and the state leads in this product. Kentucky raises about nine tenths of the hemp fiber of the country. Cotton, sorghum, potatoes, sweet potatoes and watermelons are extensively grown. Apples, peaches, pears and other tree fruits, grapes and small fruits are increasingly produced. Dairying and sheep raising, for which the state is admirably adapted, are increasing. Large quantities of poultry are produced. Lumbering is carried on to a considerable extent. River fisheries are extensive. Leading minerals are coal, iron, fluorspar, limestone and petroleum; clay, sandstone, limestone and cement are also important. Manufactures in order of their importance are flour, lumber and planing-mill products, tobacco, clothing, iron and steel, cars, meat products, foundry and machine-shop products, carriages and wagons, leather. Formerly Kentucky was a large producer of distilled and malt liquors, but this industry has been largely suspended.

Transportation and markets. Kentucky is well served by both railroads and navigable rivers. Louisville, Covington, Paducah and Nashville are excellent markets.

History. Originally a part of Augusta County, Virginia, Kentucky was formed into a separate county in 1776. First settlement at Harrodsburg, 1774. A fort was built on present site of Boonesboro by Daniel Boone, 1775. In 1780, Kentucky was divided into 3 counties, and in 1789, separated from Virginia. Admitted into the Union in 1792. The Kentucky Governor wished to remain neutral at the outbreak of the Civil War, but elections in 1861 showed that the people favored the Union cause, and the state remained in the Union.

Agricultural organization. College of Agriculture and Experiment Station; Coöperative Demonstration Work, *Lexington;* Industrial and Normal Institute for Colored Persons, *Frankfort;* Board of Agriculture, *Frankfort;* State Grange, Beef Cattle Breeders' Association, Dairy Cattle Club, Corn Growers' Association, Horticultural Society, Burley Tobacco Society, Trotting Horse Breeders' Association, Poultry Association, Duroc-Jersey Association, Berkshire Association, Sheep Breeders' Association, Swine Breeders' Association, State Fair Association.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,289,905; *2,147,174*
White	2,027,955
Colored	261,950
(City, 555,442; country, 1,734,463)	
Number farmers	259,185; *234,667*
(White, 247,455; non-white, 11,730)	
Land area, acres	25,715,840
Acres in farms	22,189,127; *21,979,422*
Acres farm land improved	14,354,471; *13,741,968*
Average acres per farm	85.6 (55.4 acres improved)
Farms by size:	
50 to 99 acres	65,778
20 " 49 "	58,537
100 to 174 acres	50,134
10 " 19 "	33,380
3 " 9 "	21,777
260 " 499 "	9,324
Value farm property	$773,797,880; *$471,045,856*
Per cent increase in 10 years	64.3
" value farm property in land	62.6
" " " " " buildings	19.5
" " " " " stock and tools	17.9
Average value all property per farm	$2,986
Average value land per acre	$21.83; *$13.24*
Per cent of farms run by owners	65.7
" " " " " tenants	33.9
" " " " " managers	.4

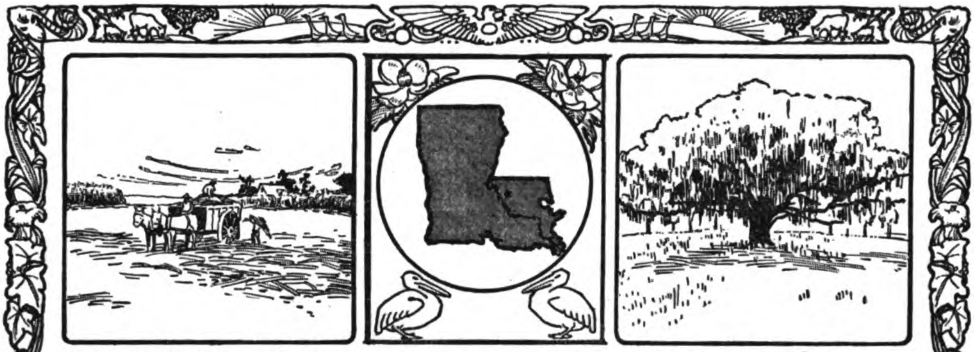
2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$138,973,107
Value all cereals		60,738,651
Corn, acres	3,436,340;	*3,900,000*
bushels	83,348,024;	*122,850,000*
value	$55,793,000;	*$148,648,000*
av. yield per acre (10 years), bushels		27.1
Wheat, acres	681,323;	*750,000*
bushels	8,739,260;	*9,000,000*
value	$8,928,000;	*$19,080,000*
av. yield per acre (10 years), bushels		12.1
Oats, acres	174,315;	*310,000*
bushels	2,406,064;	*8,060,000*
value	$1,912,000;	*$6,126,000*
av. yield per acre (10 years), bushels		21.4
Rye, acres	26,813;	*30,000*
bushels	255,532;	*375,000*
value		*$656,000*
Value other grains and seeds		$765,903
Hay and forage value		$10,306,347
acres		966,374
tons		957,241
Value vegetables		$11,850,994
Value other crops		50,291,984

Potatoes, acres	55,750;	bushels,	5,120,141
	70,000;	"	*6,720,000*
Sweet potatoes, yams, acres	11,882;	"	1,326,245
	12,000;	"	1,140,000
Tobacco, acres	469,795;	pounds,	398,482,301
Beans, acres	12,434;	bushels,	70,557
Dry peas, acres	8,465;	"	44,772
Sorghum cane, acres	62,327;	tons,	226,303
Sorghum cane, sirup made, gallons	2,733,683		
Hemp, acres	6,855;	pounds,	6,420,232
Value fruits and nuts			$5,019,231
Apples, trees	5,538,267;	bushels,	7,368,499
			9,125,000
Peaches, nectarines, trees	2,245,402;	"	1,623,379
			1,034,000
Pears, trees	337,355;	"	251,536
			204,000
Plums, prunes, trees	355,858;	"	139,346
Cherries, trees	212,118;	"	52,163
Grapes, vines	605,002;	pounds,	3,680,182
Small fruits, acres	4,387;	quarts,	4,972,702

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			241,909
Value of domestic animals			$112,605,412
Cattle, number	1,000,937;	value,	$25,971,571
	988,000;	"	*39,900,000*
Dairy cows, number	409,834		
	418,000;	"	*20,691,000*
Horses, number	443,034;	"	44,796,120
	434,000;	"	*40,362,000*
Mules, number	225,043;	"	26,402,090
	224,000;	"	*25,088,000*
Swine, number	1,491,816;	"	8,951,692
	1,589,000;	"	*14,142,000*
Sheep, number	1,363,013;	"	5,573,998
	1,155,000;	"	*8,200,000*
Poultry, number	8,764,204;	"	4,461,871
Bees, colonies	152,991;	"	419,379
Milk produced, gallons			125,566,917
Butter produced, pounds			38,130,687
Value dairy products			$9,055,813
Value poultry products			13,279,971
Value animals sold			43,080,628
Value animals slaughtered			11,652,749



LOUISIANA

LOUISIANA ("Creole State") a Gulf State, lies between 28 and 33 degrees north latitude, and 89 and 94 degrees west longitude. The Mississippi and Pearl Rivers form most of the eastern boundary, and the Sabine River a large part of the western. Other rivers within the state are the Red, Ouachita, and Pearl. Area, 48,506 square miles of which about 3,097 are water surface. The state has a coast of very irregular outline, and many outlying islands.

Land surface. Approximately 36 per cent of the area is hill land, 30 per cent alluvial or bottom lands, 8 per cent high prairie, 7 per cent "bluff," 4 per cent pine flats, 3 per cent lakes and 12 per cent flat prairie and coast marsh. The hill lands vary from gentle undulations to rather steep hills reaching in the north central portion of the state an elevation of 484 feet. The hill section west of the Mississippi River extends from the west bank of the Ouachita River to the western border of the state, a distance of about 125 miles, and from the Louisiana-Arkansas line southward an extreme distance of about 185 miles, forming a broad V-shaped area. The alluvial formation of the Red River cuts through this territory diagonally from the northwest corner to the southeast, with a width varying from 2 to 20 miles. About one-half of the area east of the Mississippi River and north of Lake Pontchartrain is also hill land. The prairie region occupies the central southern portion of the state with a belt extending westward to the state line, with an elevation not often exceeding 50 feet above sea level. The greater portion of the "bluff" area is adjacent to the east bank of the Mississippi River, from Baton Rouge to the Mississippi state line, and to the west bank of the Bayou Mason in north Louisiana, though a broken belt extends from the Bayou Mason ridge to the Gulf. This formation is often cut into deep ravines near the streams, but otherwise is of gently rolling surface, or almost flat. "Pine flats" are level stretches of pine forests bordering the hill lands in the southeastern and the southwestern portions of the state. The alluvial lands have been formed from the deposits of the sediment-carrying streams. The flood plains of the Mississippi, Red, Ouachita and Atchafalaya Rivers constitute the more important areas of this formation. The banks of the streams are the highest elevations. Some of the alluvial lands of the Red and the Ouachita Rivers are above the crest of the highest flood waters, but the remaining territory is protected from overflow during flood periods by earth embankments or levees along the banks of the streams.

Soils. There are several varieties of soils in each formation. Sandy loams and sandy soils prevail in the hill lands, of moderate fertility, respond readily to fertilizers, and are easily cultivated. In the alluvial sections, the areas nearest the streams are generally sandy, or sandy loams, gradually blending into stiff silt soils of the lower levels, all very fertile. The bluff soils vary widely, but light silt and clay loams predominate, less fertile than the alluvial, more fertile than the hill. The pine flats are generally regarded as poor soils, though with good surface drainage and heavy fertilization, they produce large yields of early truck crops. Prairie soils generally overlie a hard pan, rendering these regions especially suited for irrigating rice crops with a minimum amount of water. They are better suited to rice and small grains than to general farming.

Climate. The climate is mild, even subtropical, in the extreme southern portion. Occasionally sudden changes in temperature occur during the winter months, and though low temperatures are of short duration, they seem colder than the thermometer would indicate. Freezing temperatures are likely to extend to the Gulf at any time during the winter months, though some win-

ters pass without such freezes. The highest temperatures ordinarily experienced in summer are about 96 degrees in the southern portion, and 98 in the northern portion. Gulf breezes temper the climate to a distance of almost 150 miles inland. The average frost-free season is about 8 months for the northern, 9 months for the southern portion of the state. The average annual rainfall is about 70 inches for New Orleans and 45 in Shreveport, with intermediate average for intermediate areas. Rainfall is generally well distributed. Complete crop failures are unknown.

Opportunities. There are no public lands valuable for agricultural purposes. Much public land has recently become valuable because of the discoveries of oil and gas on or near them. Land offices are at Baton Rouge.

Products and industries. Leading farm activities are the production of sugar cane, cotton and rice, with corn the leading cereal, and the production of vegetables for northern markets, sweet and Irish potatoes, fruits and livestock. Louisiana leads in the production of sugar cane and rice, but corn, sugar and cotton have each held the place of greatest value in recent years. Rice is largely grown on the prairie soils toward the western border, much being irrigated from wells by pumping. Hay and oats are important crops. Some orchard fruits are grown in the north, and subtropical fruits in the south, but the most important small fruit is the strawberry. Special trains are operated for transporting the strawberry crop of Tangefeboa Parish during the high productive portion of the season. Blackberries and dewberries are abundant in uncultivated lands. Grapes do well if sprayed for protection against black rot. Potatoes and sweet potatoes thrive. Pecan orcharding is becoming an important industry. Livestock growing is increasing. Dairying is important. Lumbering is extensive, its products ranking second in value in the United States. Fisheries employ many men, with considerable capital invested. The state ranks first in the United States in the production of furs. The oyster and shrimp fisheries supply several large canning factories, as well as an extensive fresh trade throughout the south and central states, distant shipments being made under refrigeration. Leading minerals are petroleum, gas, sulphur, salt. Main manufactures are sugar, sirup, and molasses, canned foods (oysters, shrimp, vegetables), lumber and timber, cottonseed oil and cake, cleaned and polished rice, bags, bakery products, malt liquors, foundry products, copper, tin, and sheet-iron products, turpentine and resin, wood distillates, paper and refined petroleum products.

Transportation and markets. Louisiana is well covered by railroads. In his report for 1916, the Commissioner of Agriculture and Immigration says: "Four or 5 years ago, there were but few miles of hard-surface roads in the state. Today there are 1,014 miles, and millions of dollars have been appropriated for a continuation of the work." A large part of the state is accessible by river steamboats. The Gulf of Mexico gives an outlet for coastwise and export shipping. New Orleans is the second largest port in the United States, and an excellent market. Shreveport, Baton Rouge, Alexandria, Monroe and Lake Charles are other leading cities.

History. Louisiana was first explored by the Spaniards in 1519 to 1541. In 1682, La Salle took possession in the name of the King of France, Louis XIV. It became an independent colony in 1711. New Orleans was founded in 1718, made the capital in 1722. Became a royal province in 1731. After various changes and revolts, in 1803, Louisiana was purchased by the United States from France. In 1804, organized as Territory of Orleans; in 1812 admitted as a state, which seceded in 1861. In 1852 the capital was removed to Baton Rouge (population, 1910, 14,897).

Agricultural organization. Agricultural and Mechanical College and Experiment Station, Commissioner of Agriculture and Immigration; State Livestock Sanitary Board, State Counsel of Defense, all *Baton Rouge*. Sugar Station, *Audubon Park;* North Louisiana Station, *Calhoun;* Rice Station, *Crowley;* Southern University and A. & M. College, Scotland Heights, *Baton Rouge*. Louisiana Dairymen's Association; Louisiana Swine Breeders' Association, Louisiana Jersey Breeders' Association; Louisiana Holstein Breeders' Association; Louisiana Horticultural Society; Louisiana Sugar Planters' Association, Louisiana Cane Growers' Association, Louisiana Rice Growers' Association. State Fair held at *Shreveport*.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,656,388; *1,381,625*
White	941,125
Colored	715,263
(City, 495,516; country, 1,159,872)	
Number farmers	120,546; *115,969*
(White, 65,667; non-white, 54,879)	
Land area, acres	29,061,760
Acres in farms	10,439,481; *11,059,127*
Acres farm land improved	5,276,016; *4,666,532*
Average acres per farm	86.6 (43.8 acres improved)
Farms by size:	
20 to 49 acres	46,389
10 " 19 "	22,241
50 " 99 "	20,248
100 " 174 "	13,681
3 " 9 "	6,671
Value farm property	$301,220,988; *$198,536,906*
Per cent increase in 10 years	51.7
" value of farm property in land	62.3
" " " " " " buildings	16.5
" " " " " " stock and tools	21.1
Average value all property per farm	$2,499
Average value land per acre	$17.99; *$9.74*
Per cent of farms run by owners	44.0

Per cent of farms run by tenants	55.3
" " " " " managers	0.8

2. Crop Acreage, Yields, Values, 1910 and *1917*

Value all crops		$77,336,143
Value all cereals		24,786,984
Corn, acres	1,590,830;	*2,347,000*
bushels	26,010,361;	*42,246,000*
value	$32,359,000;	*61,679,000*
av. yield per acre (10 years), bushels		20.3
Rice, acres	317,518;	*500,000*
bushels	10,839,973;	*18,250,000*
value	$8,555,000;	*34,675,000*
av. yield per acre (10 years), bushels		33.6
Oats, acres	29,711;	*84,000*
bushels	420,033;	*1,873,000*
value	$379,000,000;	*1,761,000*
av. yield per acre (10 years), bushels		20.7
Value other grains and seeds		$720,285
Hay and forage, value		2,433,101
acres		180,811
tons		245,815
Value vegetables		$6,282,904
Value other crops		41,911,612
Dry peas, acres	33,150; bushels,	161,659
Peanuts, acres	25,020, "	412,037
Potatoes, acres	19,655;	*25,000*
bushels	1,183,525;	*1,600,000*
value		*$2,944,000*
Sweet potatoes and yams, acres	56,953;	*62,000*
bushels	4,251,086;	*4,898,000*
value		*$5,094,000*
Cotton, acres	957,011; bales,	268,909
	1,350,000; "	*615,000*
Sugar cane, acres	329,684; tons	4,941,996
Sirup made, gallons		4,125,083

Value fruits and nuts			$1,201,257
Apples, trees	93,304;	bushels,	33,875
Peaches and nectarines, trees	903,352;	"	290,623
			478,000
Pears, trees	57,630;	"	35,554
			52,000
Plums and prunes, trees	149,929;	"	31,473
Grapes, vines	31,041;	pounds,	106,595
Figs, trees	71,464;	"	2,025,308
Oranges, trees	266,116;	boxes,	149,979
Small fruits, acres	3,587;	quarts	6,420,207
Pecans, trees	36,527;	pounds,	723,578

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			113,249
Value of domestic animals			$43,314,683
Cattle, number	804,795;	value,	$11,605,354
	749,000;	"	*21,008,000*
Dairy cows, number	279,097;		
	274,000;	"	*11,508,000*
Horses, number	181,286;	"	11,789,695
	195,000;	"	*16,770,000*
Mules, number	131,554;	"	15,624,962
	139,000;	"	*17,375,000*
Swine, number	1,327,605;	"	3,824,046
	1,584,000;	"	*14,573,000*
Sheep, number	178,287;	"	343,046
	240,000;	"	*696,000*
Poultry, number	3,542,447;	"	1,326,614
Bees, colonies	29,591;	"	58,188
Milk produced, gallons			32,702,130
Butter produced, pounds			6,232,006
Value dairy products			$2,761,380
Value poultry products			3,645,827
Value animals sold			2,933,052
Value animals slaughtered			2,847,114

MAINE

MAINE ("Pine Tree State"), one of the New England States, and farthest north of the Atlantic States, is situated between 43 and 48 degrees north latitude, and 66 and 72 degrees west longitude. A number of rivers mark the boundary lines; the St. Francis and St. John on the north, the St. Croix on the east. Area 33,040 square miles, of which 3,145 are water surface.

Land surface. This is very irregular, being hilly to mountainous in the northwest, with a broad plateau covering most of the north central part. A central highland extends eastward across the state from about 46 degrees north latitude, about 1,500 feet high on the western border, to about 450 on the eastern. The country north of this highland drained by the St. John River is largely a forest dotted with lakes and swamps. South of the central highland the state slopes south and southeast and is drained by the St. Croix, Penobscot, Kennebec, Androscoggin and Saco Rivers. Hundreds of the state's 1,620 lakes are found here. The highest elevations are Mt. Katahdin in the central part, 5,200 feet; Mt. Bigelow, 3,600 feet, and Mt. Abraham, 3,388 feet, in the western part. The coast is very irregular with many bays; the headlands are mostly rocky and dangerous for vessels.

Soils. The soils are as varied as the sur-

face. Many of them are too poor and rocky for profitable cultivation. Along the rivers and about the lakes and between the Penobscot and Kennebec Rivers are very fertile alluvial soils. Along the seacoast is much sterile sand and clay. In the northern and northeastern part, in Aroostook County, is a large area of very fertile soil.

Climate. The climate is healthful but severe in winter. The ocean modifies the temperature considerably in the south, but the winters are long and snowfalls heavy. Temperatures vary considerably according to location and elevation, the annual average for the state being 43.6 degrees, varying from 41.1 degrees at Eastport and Mayfield to 45.4 degrees at Portland. Highest recorded temperature is 106 degrees at Millinocket; lowest 36 degrees below zero at several stations. Average annual rainfall, including snow, is 44.7 inches. Annual average snowfall is 81.3 inches. The frost-free season averages about 137 days, varying from 112 to 167 days at different stations. The summer and fall climates are especially delightful over most of the state.

Opportunities. Large areas are still in forest, and there is opportunity for pioneer work in lumbering and clearing the soil. Information about available land may be obtained from the Experiment Station at Orono.

Products and industries. Leading farm activities are the production of hay, oats and a few other cereals, sweet corn for canning, potatoes, apples, dairy products, and purebred dairy cattle, Ayrshires leading. Aroostook County is famed for the yields and quality of its potatoes and the successful raising of the crop is gradually being extended farther south, whence shipping rates are lower. Fine apples are grown in the southwestern part. Market garden crops, small fruits and poultry are produced in quantities to supply the many summer resorts. Immense quantities of wild blueberries are gathered. Lumbering is an important industry, the greater part of the state being still covered with forests. In fisheries, Maine ranks next to Massachusetts in capital invested and first in number of men engaged. Among the minerals, granite, limestone, marble, slate and clay products lead. Manufacturing enterprises are important and increasing on account of the abundant water power. Leading products are wood pulp, lumber and timber, cotton and woolen goods, boots and shoes, canned and preserved fish, vegetables and fruits, foundry and machine-shop products, flour, ships and leather. Chief manufacturing centers are Portland, Lewiston, Biddeford and Auburn. Bath is an important ship-building center.

Transportation and markets. The inhabited parts of the state are fairly well covered by railroads. There are also well-developed electric lines. The larger rivers are navigable for comparatively short distances, but the irregular coast line, about 2,000 miles long, provides many excellent harbors, from which lines of steamers run to Boston, New York and other market cities. The numerous summer resorts on the coast and inland also furnish excellent markets for all food products. Portland, Bangor and Eastport are ports of entry from which exports and imports are extensive.

History. Some explorations were made early in the sixteenth century and later, but not till the beginning of the next century were any settlements made, the first permanent one being at Pemaquid in 1625. Several other settlements were made along the coast during the next few years. Maine was a part of Massachusetts Territory until early in the eighteenth century. It was finally separated and admitted to the Union in 1820.

Agricultural organization. College of Agriculture and Experiment Station, *Orono*. Commissioner of Agriculture, Horticulturist, Bureau of Inspection, Livestock Sanitary Commissioner, all *Augusta*. Dairy Inspector, *Auburn;* Seed Improvement Work, *Brunswick;* Bureau of Marketing and Supplies, *Dexter*. There are the Dairymen's Association, Livestock Breeders' Association, Pomological Society, Poultry Association, Agricultural Fair Associations, State Grange, Farmers' Union.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	742,371; *694,466*
White	739,995
Colored	1,363
Other non-white	1,013
(City 381,443; country, 360,928)	
Number farmers	60,106; *59,299*
(White, 59,987; non-white, 29)	
Land area, acres	19,132,800
Acres in farms	6,296,859; *6,299,946*
Acres farm land improved	2,360,657; *2,386,889*
Average acres per farm	104.9 (39.3 acres improved)
Farms by size:	
50 to 99 acres	17,895
100 " 174 "	16,633
20 " 49 "	9,492
175 " 259 "	5,653
10 " 19 "	3,539
3 " 9 "	3,456
Value farm property	$199,271,998; *$122,410,904*
Per cent increase in 10 years	62.8
" value of farm property in land	43.4
" " " " " " buildings	36.7
" " " " " " stock and tools	19.9
Average value all property per farm	$3,320
Average value land per acre	$13.73; *$7.85*
Per cent of farms run by owners	94.1
" " " " " tenants	4.3
" " " " " managers	1.7

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$39,317,647
Value all cereals		3,100,902
Oats, acres	120,991;	*170,000*
bushels	4,232,309;	*4,930,000*
value	$2,666,000;	*4,190,000*
av. yield per acre (10 years), bushels		38.1
Buckwheat, acres	15,552;	*15,000*
bushels	316,782;	*322,000*
value	$509,000;	*$483,000*
av. yield per acre (10 years), bushels		28.9

Corn, acres	15,213;		*20,000*
bushels	648,882;		*780,000*
value	$555,000;		*$1,778,000*
av. yield per acre (10 years), bushels			41.4
Barley, acres	4,136;		*7,000*
bushels	106,674;		*147,000*
value	$188,000;		*$191,000*
av. yield per acre (10 years), bushels			28.0
Wheat, acres	3,407;		*$11,000*
bushels	85,119;		*154,000*
Value other grains and seed			$287,989
Hay and forage, value			$15,115,821
acres			1,255,011
tons			1,113,095
Value vegetables			12,377,717
Value other crops			5,986,978
Dry beans, acres	10,341;	bushels,	87,565
	33,000;	"	*330,000*
Dry peas, acres	537;	"	4,963
Potatoes, acres	135,799;	"	28,556,837
	150,000;	"	*20,250,000*
Value fruits and nuts			$2,448,240
Apples, trees	3,476,616;	bushels,	3,636,181
			4,617,000
Peaches, nectarines, trees	5,102;	"	2,014
Pears, trees	46,683;	"	38,964
			24,000
Plums and prunes, trees	43,576;	"	14,637
Cherries, trees	14,288;	"	2,403
Grapes, vines	9,731;	pounds,	231,529
Small fruits, acres	1,260;	quarts,	2,285,415
Maple trees			252,764
Sugar made, pounds			15,388
Sirup made, gallons			43,971

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			53,280
Value of domestic animals			$23,989,561
Cattle, number	256,523;	value,	$7,784,384
	272,000;	"	*12,465,000*
Dairy cows, number	156,819;	"	
	162,000;	"	*9,396,000*
Horses, number	107,574;	"	14,364,756
	109,000;	"	*16,568,000*
Mules, number	358;	"	72,446
Swine, number	87,156;	"	948,094
	100,000;	"	*1,660,000*
Sheep, number	206,434;	"	813,976
	157,000;	"	*989,000*
Poultry, number	1,735,962;	"	1,131,921
Bees, colonies	7,592;	"	40,357
Milk produced, gallons			56,026,334
Butter produced, pounds			13,299,229
Value dairy products			$8,079,692
Value poultry products			4,881,260
Value animals sold			6,531,033
Value animals slaughtered			1,888,888

MARYLAND

MARYLAND ("Monumental State"), one of the South Atlantic States, lies between 37 and 40 degrees north latitude, and 75 and 80 degrees west longitude. The Potomac River forms most of its southern boundary. Chesapeake Bay, with the Susquehanna River flowing into it, divides the State into two parts. Area, 12,210 square miles of which 2,350 are water surface.

Land Surface. About two thirds of the eastern part of the State is in the Coastal Plain, low and comparatively level, with a very irregular outline due to the many bays and rivers that open into Chesapeake Bay. Next to the west is the Piedmont region, more elevated and broken into hills and valleys. The narrow western part, in the Appalachian Plateau, is crossed by numerous mountain ridges, and has an average elevation of 2,500 feet.

Soils. The soils of the eastern half are sandy loams well suited to the cultivation of fruits and vegetables. West of these are limestone and shale formations with an admixture of clay, most of them being very fertile, especially in the valleys. The mountainous western part is adapted to live stock and diversified farming typical of the northern states. The soils are strong and productive. Grass, clover, corn and alfalfa abound.

Climate. This varies greatly between the low coast region and the elevated western part. In the former, extending to the District of Columbia, the climate is comparatively even, the average annual temperature being 54 degrees. The highest recorded is 105 degrees at Annapolis, and the lowest, 15 below zero at Easton. The frost-free season averages about 185 days, and the average annual rainfall is about 44 inches, varying about 10 inches at different stations. Snowfalls are light and do not last long. The remainder

of the State has an annual average temperature of 53 degrees; the highest recorded temperature is 107 degrees at Westernport, and the lowest, 23 degrees below zero at Bachman's Valley. Even when hot spells occur here, the nights are usually cool. Average annual rainfall is 39 inches, pretty well distributed throughout the year. Average frost-free season is about 170 days.

Opportunities. Maryland offers unusual agricultural opportunities by virtue of its variety of soil, mild and salubrious climate, nearness to markets and the wide range in the phases of the industry that can be conducted successfully. Considering its possibilities, good land is reasonable in price. Information about land may be obtained from the State Board of Agriculture, College Park.

Products and industries. Leading farm activities are general farming and fruit and vegetable growing. Corn is the leading cereal, followed by wheat, oats and rye. Hay and forage, potatoes, and sweet potatoes and tobacco are produced. Apples lead the orchard fruits, being largely grown in the western part, the rest being mostly pears, peaches and nectarines. Grapes are grown to a considerable extent. Vegetable growing is extensive, both for market and for canning. Nearly half the pack of tomatoes in the country is in Maryland. Strawberries are the leading small fruit, followed by raspberries, blackberries and dewberries. Horses and cattle are the most important farm animals. Hogs, sheep and poultry are rapidly increasing. About 3,000 square miles of forests permit considerable lumbering, mostly hardwoods. Maryland is among the leaders in fisheries, oysters and crabs being important sea crops. Its diamond-back terrapin and canvas-back duck are world famed. Coal is the most valuable mineral, but iron, granite, roofing slate, feldspar and clay are important. Main manufactures in order of importance are clothing, copper, tin and sheet-iron; canned products including fruits, vegetables, fish, oysters, pickles and preserves, meats; lumber and timber, tobacco, fertilizers and flour. Baltimore is the leading manufacturing city.

Transportation and markets. Maryland is well served by railroads in all parts. There are numerous electric lines. Chesapeake Bay with its numerous branches furnishes ample communication both internally and for export trade. There are also numerous connecting canals that help the inland communication. The Potomac River is also an important means of water communication in the south and west. Baltimore is a port of entry with extensive exports and imports. Maryland is famous for her excellent state-controlled road system. Excellent roads connect all important points. The network is being rapidly increased. In 1917 there were, approximately, 1,000 miles of state roads and 300 miles of state-aided roads. These roads are constructed of macadam, concrete, gravel and shell.

History. Maryland was granted by Charles I to the Second Lord Baltimore in 1632. The first colonists arrived in 1634, and laid out the City of St. Mary's. Here the first assembly met, 1635. The capital was removed to Annapolis in 1694. Baltimore was founded in 1730. Maryland was a leader in the Revolutionary War, and was one of the original 13 colonies. In the Civil War, Maryland's sympathies were divided, but she remained in the Union.

Agricultural organization. State Board of Agriculture, *Baltimore* and *College Park*, is in charge of all State work in agriculture. Maryland State College of Agriculture, *College Park*. The Experiment Station and Extension Service are Divisions of the State College. The executive officer of the State Board of Agriculture is the President of the State College. The State College, in coöperation with the U. S. Department of Agriculture, maintains Agricultural Agents and Home Economics Agents in every county of the State. The Maryland Agricultural Society is a federation of the Maryland Horticultural Society, Maryland Crop Improvement Association, Maryland Dairymen's Association and the Maryland Beekeepers' Association. The address of the Secretary of the Agricultural Society is *College Park*. These organizations hold annually an agricultural and horticultural exhibition in Baltimore known as the Maryland Week Exposition. There are held annually a number of local or county fairs, among which the Hagerstown Fair and the Frederick Fair are the most important. There is no State Fair. The Maryland State Grange is a branch of the National Organization, and is well organized in most of the counties of the state.

Statistics

1. Farms and Farm Property, 1910 and *1900*

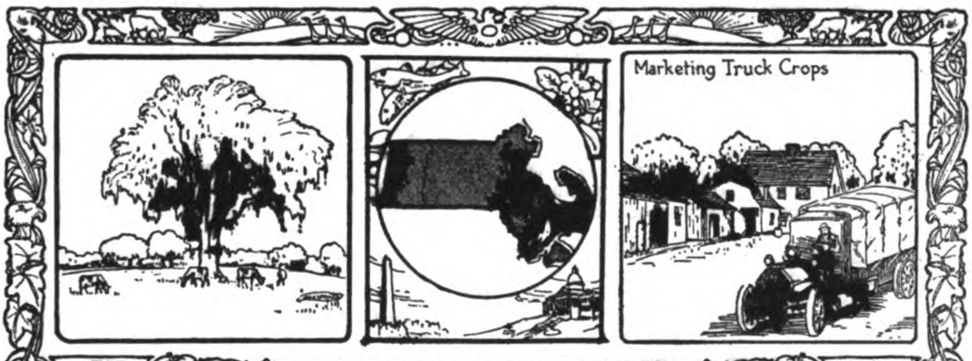
Population	1,295,346; *1,188,044*
White	1,062,644
Colored	232,702
(City, 658,192; country, 637,154)	
Number farmers	48,923; *46,012*
(White, 42,551; non-white, 6,372)	
Land area, acres	6,362,240
Acres in farms	5,057,140; *5,170,075*
Average acres farm land improved	3,354,767; *3,516,352*
Average acres per farm	103.4 (68.6 acres improved)
Farms by size:	
100 to 174 acres	11,457
50 " 99 "	9,946
20 " 49 "	8,629
10 " 19 "	5,107
175 " 259 "	5,043
3 " 9 "	4,977
Value farm property	$286,167,028; *$204,645,407*
Per cent increase in 10 years	39.8
" value farm property in land	57.1
" " " " " buildings	27.4
" " " " " stock and tools	15.5
Average value all property per farm	$5,849
Average value land per acre	$32.32; *$23.28*
Per cent of farms run by owners	68.5
" " " " " tenants	29.5
" " " " " managers	2.5

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$43,920,149
Value all cereals		21,908,730
Corn, acres	647,012;	*720,000*
bushels	17,911,436;	
value	$13,795,000;	*$39,312,000*
av. yield per acre (10 years), bushels		34.3
Wheat, acres	589,893;	*675,000*
bushels	9,463,457;	*11,475,000*
value	$12,711,000;	*$23,753,000*
av. yield per acre (10 years), bushels		16.5
Oats, acres	49,210;	*47,000*
bushels	1,160,663;	*1,457,000*
value	$373,000;	*$1,093,000*
av. yield per acre (10 years), bushels		28.4
Rye, acres	28,093;	*24,000*
bushels	357,562;	*384,000*
value	$254,000;	*$645,000*
Buckwheat, acres	10,388;	*11,000*
bushels	152,216;	*220,000*
value		*$363,000*
Dry peas, acres	742	
bushels	5,603	
Value other grains and seed		$96,104
Hay and forage, value		$6,011,749
acres		398,842
tons		477,564
Value vegetables		$7,996,105
Potatoes, acres	*60,000;* bushels.	*6,000,000*
Potatoes, sweet, acres	*10,000;* "	*1,180,000*
Value fruits and nuts		$2,805,526
Value other crops		5,101,935
Apples, trees	1,288,482; bushels,	1,822,824
		2,525,000
Peaches, nectarines, trees	1,497,724; "	324,609
		975,000
Pears, trees	540,583; bushels	367,359
		525,000
Prunes and plums, trees	69,996; "	13,526
Cherries, trees	82,305; "	42,315
Quinces	20,936; "	6,359
Grapes, vines	138,801; pounds,	2,152,382
Figs, trees	1,432; "	38,772
Small fruits, acres	16,595; quarts,	26,277,054
Nuts, trees	11,780; pounds,	318,148

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			46,672
Value of domestic animals			$30,649,961
Cattle, number	287,751;	value,	$7,869,526
	308,000;	"	*14,639,000*
Dairy cows, number	166,859;	"	5,580,210
	183,000;	"	*10,614,000*
Horses, number	155,438;	"	16,787,467
	169,000;	"	*17,745,000*
Mules, number	22,667;	"	3,043,581
	25,000;	"	*3,175,000*
Swine, number	301,583;	"	1,765,857
	359,000;	"	*4,128,000*
Sheep, number	237,137;	"	1,142,965
	223,000;	"	*1,472,000*
Poultry, number	2,908,958;	"	1,858,570
Bees, colonies	23,156;	"	61,603
Milk produced, gallons			41,094,421
Butter produced, pounds			8,739,620
Value dairy products			$5,480,900
Value poultry products			5,831,611
Value animals sold			5,399,896
Value animals slaughtered			3,069,871



MASSACHUSETTS

MASSACHUSETTS ("Bay State"), one of the New England States, lies between 41 and 43 degrees north latitude, and 70 and 74 degrees west longitude. The largest river is the Connecticut which flows entirely across the state from north to south. West of this the Hoosac River flows to the Hudson and the Housatonic to Long Island Sound. The Merrimac flows through the northeast corner into the Atlantic. Area, 8,266 square miles of which 227 are water. Perhaps half the state is forested, chiefly by second-growth timber.

Land surface. An elevated ridge crosses the state from north to south about in the center. East of this, the slope is toward the east and southeast; the southeastern part, including a few islands, is low and sandy, often marshy. A plateau with about 1,000 feet elevation, sloping westward toward the Connecticut River, lies west of the central divide. West of the river the surface is hilly and broken, making up the Berkshire Hills and the Hoosac and Taconic Mountains. The highest points are Greylock, 3,535 feet, Mt. William, 3,040 feet, Mt. Everett, 2,625 feet.

Soils. The soils all over the state are typical glacial formations, well sprinkled with rocks and boulders. Along the coast they become lighter, and vary from marshy to almost clear sand; in the river valleys, they are

naturally deeper and richer. For the most part they are naturally strong, fertile unless worn out by poor methods, and in any case responsive to care and special treatment. Lime is quite generally deficient, its use being quite essential to satisfactory results with most crops. The supply of manures is not sufficient to maintain production at a satisfactory level, and commercial fertilizers are largely employed. The Connecticut River Valley is especially rich and productive. The rocky nature of the soils, and the small, irregular-shaped fields have generally made extensive farming difficult. Capital, however, has in recent years been more extensively employed, obstacles to the use of machinery (such as boulders, stones and old fences) have been removed, and extensive farm operations are becoming increasingly common.

Climate. The Massachusetts winter is long and cold with a good deal of snow. However, in the western, higher section where the lowest temperatures occur, the drier air makes the winter seem less severe than in the lower, moister eastern country. The ocean modifies the summer temperatures along the coast and also causes frequent fogs; inland a generally cool summer with occasional short spells of really hot weather may be expected. The frequent changes of weather result in a varied climate that is either thoroughly enjoyed or thoroughly disliked, though spring and fall are usually very pleasant. The average annual temperature is 47.5 degrees; highest recorded 102 degrees at Boston and Lawrence; lowest, 28 degrees below zero at Turners Falls. Average annual snowfall varies from 26.1 inches at Nantucket (on the coast) to 61.5 inches at Fitchburg (in the hills). Average annual precipitation (rain and snow), 45 inches. Frost-free season averages 165 days.

Opportunities. There are some untilled farms, and considerable unimproved land in some parts of the state. Information may be obtained from the State Board of Agriculture at Boston.

Products and industries. Massachusetts is primarily a manufacturing state; its agriculture is varied but includes, chiefly, general farming on rather small areas and intensive dairying and fruit, vegetable and poultry raising designed to supply local markets—the larger cities and the smaller but thickly populated factory towns. Grains are not largely grown, but hay is a very important crop both for home feeding and for marketing; both climate and soil are well suited to grass growing. Orchards are scattered over the state and a good many apples are produced; small fruits are a more important product. Vegetable growing is highly developed around the cities, and a large acreage of greenhouses and hotbeds aids in forcing early crops of both vegetables and flowers, and the production of hothouse fruits, vegetables and flowers. Tobacco and onions of highest quality are the main crops in the Connecticut Valley, while the bogs of Cape Cod form one of the few commercial centers of the cranberry industry. Lumbering is not an important business though most farmers maintain and derive profit from their woodlots. Dairying in the center and northern sections of the state and poultry raising in the south and southeast are the leading livestock activities; there are many good herds of purebred dairy cattle. Except for its hay, hothouse vegetables and flowers, cranberries, tobacco and onions, Massachusetts aims to meet its own needs rather than those of other sections. Ocean fisheries are a source of great wealth, Massachusetts being a leader in this industry since Colonial days. Leading minerals are granite, sandstone, marble, clay, emery, graphite and asbestos. Its extensive river water power is at the basis of the importance of Massachusetts in manufacturing. Main products are boots and shoes, rubber goods, machinery and allied products, cotton and woolen goods, leather, jewelry, cordage and twine, paper and wood pulp, hosiery and knit goods, carpets and rugs, confectionery, furniture, electrical apparatus, refined sugar and molasses. Leading manufacturing cities are Fall River, Lowell, New Bedford, Lawrence and Taunton of cotton goods; Brockton, Lynn and Haverhill boots and shoes; Holyoke, paper and wood pulp; Springfield, firearms, machinery; Lawrence, worsted goods; Worcester, machinery, iron and steel, carpets; Attleboro and North Attleboro jewelry; Pittsfield, electrical machinery.

Transportation and markets. Massachusetts was the pioneer in railroad construction and is well covered with both steam and electric lines. The percentage of improved roads—which are well kept up—in relation to total mileage is higher than in any other state. There are 10 ports of entry, and communication by water is carried on to many parts of the country and of the world.

History. First settlement by the Pilgrims at Plymouth, in 1620. Boston was settled in 1630. Massachusetts was declared a royal province in 1684. In 1774 a state government and militia were organized, and in 1780, the present constitution was adopted and slavery was abolished. In 1788, the United States Constitution was ratified.

Agricultural organization. Agricultural College and Experiment Station, *Amherst;* Asparagus Branch Station, *Concord;* Cranberry Branch Station, *Wareham;* State Board of Agriculture, *Boston.* There are also Creamerymen's Association, Fruit Growers' Association, Horticultural Society, Forestry Association, Dairymen's Association, Poultry Association, Cattle Owners' Association, Nurserymen's Association.

The Experiment Station Director reports that, in recent years there has been a small

decrease in the state's total area under cultivation, but an increase in the total of agricultural products, and a large increase in their value. The tendency has been to give up carelessly and half-cultivated areas and those poorly suited for farm operations, and to do more thorough work on better located and naturally better soils. A further tendency for many years has been toward special crops. As a consequence, capital has been attracted, considerable areas have been reclaimed, and large commercial farm ventures are increasingly common. These developments have been carried on chiefly through private capital and enterprise. But the state has done something in the better utilization of its land areas through the employment of dependent and unemployed classes in reclamation projects. The State Forester is also empowered, under certain conditions, to purchase unimproved land and reforest it, the plan being to allow the original owners to repurchase if they so desire. The most significant crop change of recent years is in the discovery and perfection of methods under which alfalfa may be successfully cultivated. Recent years have seen successful efforts aimed towards community betterment and coöperative organization. The large proportion of highly improved state, county and town roads has contributed largely to these improvements.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	3,366,416	*2,805,346*
White	3,324,926	
Colored	38,055	
Other non-white	3,435	
(City, 3,125,367; country, 241,049)		
Number farmers	36,917	*37,715*
(White, 36,793; non-white, 124)		
Land area, acres	5,144,960	
Acres in farms	2,875,941	*3,147,064*
Acres farm land improved	1,164,501	*1,292,132*
Average acres per farm	77.9 (31.5 acres improved)	
Farms by size:		
20 to 49 acres	8,890	
50 " 99 "	7,981	
100 " 174 "	5,703	
10 " 19 "	4,956	
3 " 9 "	4,817	
Value farm property	$226,474,025	*$182,646,704*
Per cent increase in 10 years	24.0	
" value farm property in land	46.6	
" " " " " buildings	39.1	
" " " " " stock and tools	14.3	
Average value all property per farm	$6,135	
Average value land per acre	$36.69	*$27.62*
Per cent of farms run by owners	86.9	
" " " " " tenants	8.1	
" " " " " managers	5.0	

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$31,948,095
Value all cereals			1,617,131
Corn acres	41,755		*61,000*
bushels	2,029,381		*2,806,000*
value	$1,592,000		*$6,033,000*
av. yield per acre (10 years), bushels			42.5
Oats, acres	7,927		*12,000*
bushels	268,500		*444,000*
value	$124,000		*$360,000*
av. yield per acre (10 years), bushels			34.4
Rye, acres	3,476		*3,000*
bushels	59,183		*57,000*
value	$80,000		*$114,000*
av. yield per acre (10 years), bushels			17.7
Buckwheat, acres	1,630		*2,000*
bushels	32,926		*30,000*
value	$56,000		*$60,000*
av. yield per acre (10 years), bushels			19.0
Barley, acres			349
bushels			9,021
Wheat, acres			109
bushels			2,404
Dry beans, acres	446		*4,000*
bushels	4,979		*40,000*
Value other grains and seeds			$17,995
Hay and forage, value			$11,280,989
acres			519,503
tons			831,955
Value vegetables			$8,184,213
Value other crops			7,062,178
Potatoes, acres	24,459;	bushels,	2,946,178
	38,000;	"	*4,370,000*
Tobacco, acres	5,521;	"	9,549,306
	8,400;	"	*11,833,000*
Maple trees			256,501
Sugar made, pounds (maple)			156,952
Sirup made, gallons			53,091
Value fruits and nuts			$3,785,589
Apples, trees	1,367,379;	bushels,	2,550,259
			2,186,000
Peaches, nectarines, trees	154,592;	"	91,756
			145,000
Pears, trees	113,365;	"	96,071
			71,000
Plums and prunes, trees	41,345;	"	17,814
Cherries, trees	13,396;	"	4,761
Grapes, vines	58,277;	pounds,	1,132,838
Small fruits, acres	9,552;	quarts,	29,260,143
Nuts, trees	6,720;	pounds,	134,920

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			32,099
Value of domestic animals			$19,208,712
Cattle, number	252,416;	value,	$9,348,076
	248,000;	"	*14,605,000*
Dairy cows, number	171,936		
	160,000;	"	*12,000,000*
Horses, number	64,283;	"	8,671,997
	59,000;	"	*9,804,000*
Mules, number	268;	"	43,385
Swine, number	103,018;	"	978,989
	112,000;	"	*1,680,000*
Sheep, number	32,708;	"	156,498
	25,000;	"	*168,000*
Goats, number	1,251;	"	7,990
Poultry, number	1,798,380;	"	1,492,961
Bees, colonies	7,464;	"	39,683
Milk produced, gallons			86,304,347
Butter produced, pounds			3,364,516
Value dairy products			$15,187,774
Value poultry products			6,258,999
Value animals sold			5,014,442
Value animals slaughtered			1,006,088

MICHIGAN

MICHIGAN ("Wolverine" or "Badger State"), one of the North Central States, lies between 41 and 48 degrees north latitude, and 82 and 91 degrees west longitude. It is divided by Lakes Michigan and Huron into the Upper and Lower Peninsulas. Except for the southern boundary of the Lower Peninsula and a small part of the southwestern boundary of the Upper Peninsula, Michigan is entirely bounded by water. The Lower Peninsula is separated from Canada by Lake Huron and the St. Clair and Detroit Rivers. The Upper Peninsula is separated from Wisconsin by the Montreal and Menominee Rivers, and from Canada by the St. Mary's River. Area (including some 200 islands), 57,980 square miles, 500 of which are water.

Land surface. Most of the Southern Peninsula is comparatively level, the highest point being only about 700 feet above the lake level. The highest point in relation to the whole country is Otsego Lake, 1,280 feet above sea level, which is on the divide extending northeast and southwest and separating the area that drains into Lake Michigan on the west from that which drains into Lakes Huron and Erie on the east. There are several large lakes, and an immense number (estimated at from 5,000 to 15,000) of small lakes and ponds. Numerous bays indent the coast, the largest being Saginaw and Thunder Bay on the east, and Grand Traverse and Little Traverse Bays on the northwest. The Northern Peninsula is higher, the Porcupine Mountains, close to, and parallel with, the northwest coast, reaching above 2,000 feet.

Soils. Those of the Lower Peninsula are largely glacial drift of a sandy loam type. The river valleys and beds of dried-up lakes are rich alluvial soil. Some of the pine lands in the north are unproductive. In the southeast are heavy clays. In the south central and southwest, are great areas of muck lands suitable for onions, celery and similar special crops. The eastern end of the Upper Peninsula has much black soil which is very fertile when drained. West of this is a rolling surface and a lighter soil well adapted to agriculture. Next is a rough and rocky region little suited for farming, but farther west is another good-sized area of fertile soil.

Climate. This is affected by the higher elevations in the north, the large bodies of water, and the storms that move eastward across the Lake Region, the latter causing frequent and sudden changes. In the north, the average annual temperature ranges from 38 to 43 degrees according to elevation. Lowest and highest recorded temperatures are 49 degrees below zero and 108 degrees above. An annual snowfall of 121.4 inches has been recorded. The average annual rainfall is 35 inches, and the frost-free season, about 120 to 130 days. In Lower Michigan the climate of the western part is much modified by the nearby lake which tempers both the cold of winter and the heat of summer. The average annual rainfall varies from about 30 inches in the north to 40 inches in the south, and snowfall from 90 inches to 40 inches. Highest and lowest recorded temperatures are 104 degrees above and 43 degrees below zero. Average annual temperature is about 46 degrees. The frost-free season averages about 150 days. Tornadoes are sometimes very destructive.

Opportunities. Michigan is said to be the nearest to self-sustaining of any state, about all the necessities of life except cotton being produced within its borders. Its natural resources are extremely varied. Large areas of Michigan land are as yet undeveloped. Particulars about this land may be obtained from the State Geologist at Lansing.

Products and industries. Leading agricultural activities are general farming, based on cereal production; the raising of apples in the south and west; of peaches along the western lake front; of grapes, especially along Lake Erie and on the western lake front; of celery, onions and peppermint on the black muck soils; of lettuce and cucumbers under glass in the vicinity of Grand Rapids; and of most other

vegetables in all parts of the state. Michigan produces about 50 per cent of the world's supply of peppermint oil. Special lines of considerable importance are vegetable and flower-seed growing and the raising of peas and other vegetables for canning. Large areas are devoted to sugar beets. Cattle and sheep are the most important livestock, and both dairying and poultry raising are extensively practised. Lumbering is not so extensive as formerly since large areas have now been cut over. The lake fisheries are extensive. Leading minerals are iron and copper in the northern peninsula, coal and salt. Main manufactures are of automobiles, lumber and timber, foundry, and machine-shop products, flour and cereal foods, refined copper, carriages and wagons, furniture, railroad cars, leather, agricultural implements, dairy products, paper and wood pulp, iron and steel. Grand Rapids is the greatest furniture manufacturing center in the world, and Detroit leads in automobiles. Battle Creek furnishes large quantities of cereal preparations.

Transportation and markets. No state has better transportation facilities. Railroads cover the state, connecting with the east, west and south. There is a large mileage of electric railways. The Great Lakes transport immense quantities of freight, Michigan having about 50 recognized harbors. A canal across the Northern Peninsula connects Lakes Michigan and Superior, and through the Chicago River and Canal, there is an outlet to the Mississippi and the Gulf. Chicago, Illinois, is the great market for the state, but the many manufacturing and mining centers furnish excellent markets within it.

History. First explorers were French missionaries and fur traders about 1610. In 1667, Father Marquette founded a mission at Sault Ste. Marie. Settlements were made at Mackinac, 1671, and Detroit, 1701. The region passed into the hands of the English, 1763. Territory incorporated in Canada in 1774. Ceded to United States in 1783. Territory of Michigan organized in 1805. State Constitution adopted 1835. Admitted to statehood 1837. Capital at Detroit until 1847, then Lansing (population, 1910, 20,276).

Agricultural organization. Agricultural College and Experiment Station, Coöperative Demonstration Work, *East Lansing*. There are also a State Agricultural Society, Horticultural Society, Experiment Association, Potato Growers' Association; Livestock Breeders and Feeders' Association, Veterinary Board, Grange, Gleaners, and numerous Farmers' Clubs.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,810,173; *2,420,982*
White	2,785,247
Colored	17,115
Other non-white	7,811
(City, 1,327,044; country, 1,483,129)	
Number farmers	206,960; *203,261*
(White, 206,014; non-white, 946)	
Land area, acres	36,787,200
Acres in farms	18,940,614; *17,561,698*
Acres farm land improved	12,832,078; *11,799,250*
Average acres per farm	91.5 (62 acres improved)
Farms by size:	
50 to 99 acres	73,748
100 " 174 "	50,622
20 " 49 "	49,890
175 " 259 "	12,426
10 " 19 "	7,719
Value farm property	$1,088,858,379; *$690,355,734*
Per cent increase in 10 years	57.7
" value of farm property in land	56.5
" " " " " " buildings	26.3
" " " " " " stock and tools	17.3
Average value all property per farm	$5,261
Average value land per acre	$32.48; *$24.12*
Per cent of farms run by owners	83.3
" " " " " tenants	15.8
" " " " " managers	0.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

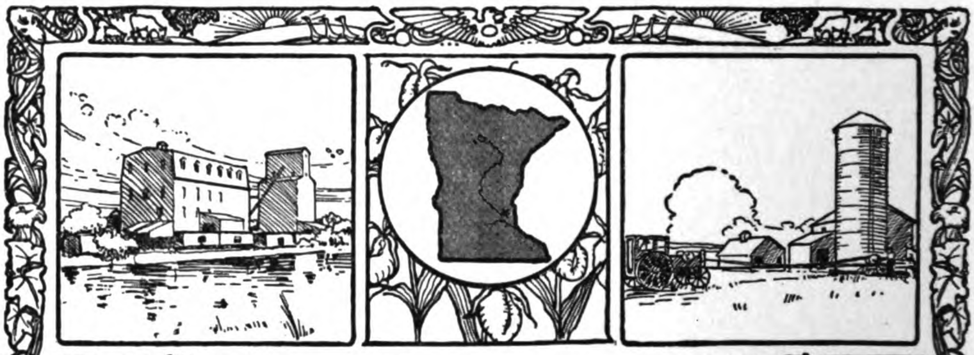
Value all crops		$162,004,681
Value all cereals		70,544,250
Corn, acres	1,589,596;	*1,750,000*
bushels	52,906,842;	*37,625,000*
value	$36,061,000;	*$68,478,000*
av. yield per acre (10 years), bushels		32.6
Oats, acres	1,429,076;	*1,550,000*
bushels	43,869,502;	*56,575,000*
value	$17,910,000;	*$36,208,000*
av. yield per acre (10 years), bushels		31.4
Wheat, acres	802,137;	*845,000*
bushels	16,025,791;	*15,210,000*
value	$13,921,000;	*$31,028,000*
av. yield per acre (10 years), bushels		17.1
Barley, acres	93,065;	*130,000*
bushels	2,132,101;	*3,445,000*
value	$1,010,000;	*$4,100,000*
Rye, acres	419,020; bushels,	5,814,394
	341,000; "	*5,115,000*
Dry beans, acres	403,669; "	5,282,511
	639,000; "	*3,515,000*
Dry peas, acres	94,932; "	1,162,403
Emmer and spelt, acres	6,742; "	154,103
Value other grains and seeds		$12,069,046
Hay and forage, value		$36,040,087
acres		2,715,301
tons		3,632,939
Value vegetables		16,201,328
Potatoes, acres	365,483;	*378,000*
bushels	38,243,828;	*35,910,000*
value		*$37,706,000*
Sugar beets, acres		78,779
tons		707,639
Maple, trees		986,737
sugar made, pounds		293,301
sirup made, gallons		269,093
Value fruit and nuts		$12,599,720
Apples, trees	7,534,343; bushels,	12,332,296
		5,160,000
Peaches and nectarines, trees	2,907,170; "	1,686,586
		744,000
Pears, trees	1,136,151; "	666,023
		1,080,000
Plums and prunes, trees	464,917; "	181,188
Cherries, trees	760,183; "	338,945
Quinces, trees	35,461; "	13,484
Grapes, vines	11,013,576; pounds,	120,695,997
Small fruits, acres	21,419; quarts,	27,214,659
Nuts, trees	37,297; pounds,	961,137
Value other crops		$14,550,250

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		196,655
Value of domestic animals		$131,746,348
Cattle, number	1,497,823; value,	$40,500,318
	1,585,000; "	*74,942,000*
Dairy cows, number	767,083;	
	865,000; "	*53,198,000*
Horses, number	610,033; "	71,312,474
	680,000; "	*82,280,000*
Mules, number	3,700; "	493,825
	4,000; "	*488,000*

Swine, number	1,245,833; value,	$9,755,042
	1,345,000; "	*16,678,000*
Sheep, number	2,306,476; "	9,646,565
	1,834,000; "	*14,305,000*
Poultry, number	9,967,039; "	5,610,958
Bees, colonies	115,274; "	446,464

Milk produced, gallons	283,387,201
Butter produced, pounds	50,405,426
Value dairy products	$26,727,538
Value poultry products	16,707,037
Value animals sold	35,915,379
Value animals slaughtered	7,652,048



MINNESOTA

MINNESOTA ("Gopher" or "North Star State"), one of the North Central States, lies between 43 and 49 degrees north latitude, and 91 and 98 degrees west longitude. Natural boundaries are the Mississippi and St. Croix Rivers and Lake Superior on the east, and several smaller lakes and rivers on the north and west. The largest rivers within the state are the Minnesota, flowing across it into the Mississippi at St. Paul and Minneapolis; the Red Lake and the Wild, flowing into the Red River of the North, and the St. Louis in the northeast discharging into Lake Superior. Area, 84,682 square miles, 3,824 of which are water.

Land surface. The general elevation above sea level ranges from about 640 feet in the southeast and 607 feet at Duluth on Lake Superior, to 1,300 and 2,000 feet in the north central part, and 2,400 feet in the northeastern part. In the northwest part, are level prairies; most of the rest of the state is gently rolling, except for the broken surface along the Mississippi where the bluffs sometimes reach 400 feet in height. Many small lakes (10,000 named) are scattered over the state, mostly in the northern part, where there are extensive areas with poor natural drainage.

Soils. These are mostly a glacial drift, very fertile except in the northern part, where both sandy and rocky land is unfitted for agriculture. Clayey loams are found on the elevations, and very fertile alluvial soils in the river valleys, particularly that of the Red River of the North. Hundreds of miles of drainage ditches in this region render available an area equal in size to the state of Rhode Island, containing some very fine agricultural lands.

Climate. In general this is rigorous in winter, mild in summer, healthful at all seasons. Temperatures vary much in different parts. The average annual temperature is 39 degrees at Duluth; 35 degrees at St. Vincent in the extreme northwest corner; 46 degrees in the southeastern part. Highest recorded temperature is 110 degrees at New London; lowest, 59 degrees below zero at St. Vincent. The frost-free season averages about 120 days in the north, 135 days in the southwest, and 145 days in the southeast. In the north the average annual rainfall decreases from 32 inches in the east to 23 inches in the west, 75 per cent of which falls from April to September. In the south the average rainfall is about 30 inches, the larger part again coming during the growing season. The average snowfall varies from 24 inches at New London, in the south central part, to 54.4 inches at Mt. Iron, in the northeast.

Opportunities. Information about agricultural opportunities may be obtained from the Agricultural Experiment Station, University Farm, St. Paul.

Products and industries. Leading farm activities are the production of spring wheat, oats and corn in the southern part; flaxseed, spring wheat and potatoes in the northern part. Cattle and swine are the leading livestock, and dairying is extensive and steadily increasing. Trucking near the cities is important. Lumbering has been important, but the forests have been considerably depleted. Lake and river fisheries are important. The leading mineral is iron ore, found in the form of the richest deposits in the world. Main manufactures are flour, in which Minnesota far outranks any other state; lumber and timber products; meat products; cheese, butter and condensed milk; railroad cars; linseed oil. Minneapolis is the center of the milling

dustry, and with St. Paul is the chief manufacturing center.

Transportation and markets. Except in the north, the state is well covered by railroads, Minneapolis and St. Paul being great railroad centers. Much transportation is effected by way of the Great Lakes and the Mississippi River. Duluth, a port of entry, is one of the most important of the Lake ports. A larger tonnage leaves the Duluth-Superior harbor annually than leaves New York harbor. St. Paul is also a port of entry, and both are important markets.

History. In 1678, a fort was established on the north shore of Lake Superior, by Duluth, a Frenchman. In 1680, Hennepin, a French missionary, discovered the Falls of St. Anthony, and by 1700 the French had founded trading posts on Lake Pepin and the Minnesota River. The territory was ceded to the English in 1763, and to the United States in 1783. The portion west of the Mississippi was included in the Louisiana Purchase, acquired from France in 1803. A clearing was made and a mill built at the Falls of St. Anthony in 1822. The territory of Minnesota was organized in 1849 with an area much larger than the present state. Minnesota was admitted to statehood in 1858. The liberal homestead laws resulted in a rapid increase of population. There is a large foreign population especially in the country. The number of foreign-born farmers exceeds those native-born. Capital, St. Paul; population, 1910, 214,744. Minneapolis is the largest city; population, 1910, 301,408.

Agricultural organization. College of Agriculture and Experiment Station, *University Farm, St. Paul.* Sub-experiment stations are located at *Crookston, Morris, Grand Rapids, Duluth* and *Waseca.* Co-operative Demonstration Work, *St. Paul;* Horticultural Society, *Minneapolis;* Field Crop Breeders' Association, Beekeepers' Association, Live Stock Breeders' Association, all *University Farm, St. Paul.* There are the Agricultural Society, Swine Breeders' Association, Dairymen's Association, Guernsey Breeders' Association, Sheep Breeders' Association, Horse Breeders' Association, Hereford Breeders' Association, and Stallion Registration Board.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,075,708; *1,751,394*
White	2,059,227
Colored	7,084
Other non-white	9,397
(City, 850,294; country, 1,225,414)	
Number farmers	156,137; *154,659*
(White, 155,844; non-white, 293)	
Land area, acres	51,749,120
Acres in farms	27,675,823; *26,248,498*
Acres farm land improved	19,643,533; *18,442,585*
Average acres per farm	177.3 (125.8 acres improved)
Farms by size:	
100 to 174 acres	55,424
175 " 259 "	27,972
50 " 99 "	26,571
Farms by size (*continued*):	
260 to 499 acres	24,864
20 " 49 "	12,028
Value farm property	$1,476,411,737; *$788,684,642*
Per cent increase in 10 years	87.2
" value farm property in land	69.0
" " " " " buildings	16.5
" " " " " stock and tools	14.4
Average value all property per farm	$9,456
Average value land per acre	$36.82; *$21.31*
Per cent of farms run by owners	78.2
" " " " " tenants	21.0
" " " " " managers	0.8

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$193,451,474
Value all cereals	140,864,148
Wheat, acres	3,276,911; *3,310,000*
bushels	57,094,412; *57,965,000*
value	$88,435,000; *$117,089,000*
av. yield per acre (10 years), bushels	13.5
Oats, acres	2,977,258; *3,250,000*
bushels	93,897,717; *120,250,000*
value	$25,127,000; *$75,758,000*
av. yield per acre (10 years), bushels	30.8
Corn, acres	2,004,068; *3,000,000*
bushels	67,897,051; *90,000,000*
value	$25,369,000; *$99,000,000*
av. yield per acre (10 years), bushels	32.3
Barley, acres	1,573,761; *1,400,000*
bushels	34,927,773; *37,800,000*
value	*$41,958,000*
av. yield per acre (10 years), bushels	23.6
Rye, acres	266,567; *410,000*
bushels	4,426,028; *7,585,000*
value	*$12,667,000*
Flaxseed, acres	358,426; *220,000*
bushels	3,277,238; *1,980,000*
value	*$5,841,000*
Dry beans, acres	4,697
bushels	62,822
Value other grains and seeds	$6,510,025
Hay and forage, value	26,724,801
acres	3,946,072
tons	6,036,747
Value vegetables	11,044,391
Potatoes, acres	223,692; *300,000;* bushels, 26,802,948; *33,600,000*
Sugar beets, acres	2,238; tons, 24,140
Maple trees	67,225
sugar made, pounds	11,399
sirup made, gallons	17,808
Sorghum, cane, acres	1,709; tons, 13,253
Sirup made, gallons	145,934
Value fruits and nuts	$1,307,377
Apples, trees	1,380,396; bushels, 1,044,156; *1,445,000*
Plums and prunes, trees	233,736; " 19,920
Cherries, trees	25,139; " 1,526
Grapes, vines	61,916; pounds, 293,805
Small fruits, acres	3,738; quarts, 4,476,575
Nuts, trees	8,110; pounds, 81,555
Value other crops	$7,000,732

3. Livestock, 1910 and *1917*

Farms reporting domestic animals	151,531
Value of domestic animals	$156,771,855

	Number		Value
Cattle, number	2,347,435;	value,	$50,306,372
	2,642,000;	"	*111,026,000*
Dairy cows, number	1,085,388;		
	1,302,000;	"	*75,516*
Horses, number	753,184;	"	89,068,872
	900,000;	"	*98,100,000*
Mules, number	5,775;	"	732,723
	6,000;	"	*660,000*
Swine, number	1,520,257;	"	13,929,127
	1,733,000;	"	*25,128,000*
Sheep, number	637,582;	"	2,693,424
	541,000;	"	*4,112,000*
Goats, number	4,588;	"	18,480
Poultry, number	10,697,075;	"	4,646,960
Bees, colonies	56,677;	"	221,781

Milk produced, gallons	273,319,603
Butter produced, pounds	34,708,669
Value dairy products	$29,219,406
Value poultry products	13,496,745
Value animals sold	34,121,517
Value animals slaughtered	6,942,498

MISSISSIPPI

MISSISSIPPI ("Bayou" or "Magnolia State") is one of the South Central and Gulf States, lying between 30 and 35 degrees north latitude, and 88 and 92 degrees west longitude. It is separated from Louisiana and Arkansas on the west by the Mississippi River. The Pearl River forms the western boundary of the southern part, and the Gulf of Mexico forms about half of the southern boundary. Big Black and Yazoo, tributary to the Mississippi, are the chief rivers. Others are the Pascagoula and the Pearl flowing to the Gulf. Area, 46,865 square miles, 503 of which are water.

Land surface. In general this is undulating or hilly. A broad, low ridge crossing the state from north to south forms the main divide. West of this the surface is broken by several narrow ridges and valleys which gradually sink to the level of the Yazoo Delta. This area is diversified by swamps, lakes, bayous and canebrakes. Farther south on the Mississippi, are bluffs which rise to a height of 200 to 500 feet. To the east of the divide, the uplands rise gradually from an elevation of 150 feet, a few miles from the coast, to a point in the northeast where some ridges reach an altitude of 600 feet. The entire drainage is directly or indirectly into the Gulf of Mexico. Several northeastern counties are typical prairie.

Soils. Most of the soils are yellow, brown or reddish loam, generally very fertile. The bottom lands are alluvial and very productive. The Yazoo Delta, between the Yazoo and Mississippi Rivers, the most fertile part of the Mississippi Valley, is protected along the course of the latter by more than 300 miles of levees.

Climate. That of the southern part is mild and subtropical. Average annual temperature for the whole state is 64 degrees. In the south, it is 67 degrees; on the northern border, 61 degrees. Average rainfall in the south is 54 inches; in the north, 49 inches; for the whole state, 51 inches. Light snowfalls sometimes reach as far south as Natchez. The summers are long and hot; the winters usually mild. The high percentage of humidity sometimes renders the heat oppressive. In the north, the highest recorded temperature is 108 degrees at Water Valley; the lowest, 13 degrees below zero at Louisville (this very exceptional); the frost-free season is 210 days. In the south, the highest recorded temperature is 109 degrees at Leakesville; lowest 10 degrees below zero at Brookhaven; and the frost-free season is about 240 days. The West Indian hurricanes sometimes cause considerable damage as do excessive rains, especially along the Gulf Coast.

Opportunities. Large areas of the cut-over lands in the southern part of the state are available at low prices. These lands are usually poor, but susceptible of improvement through the use of chemicals and green-manure crops. Information about these and other lands may be obtained from the Agricultural Experiment Station, Agricultural College.

Products and industries. Leading farm products are cotton (its value being 3 times as great as that of all the cereals), corn, sweet potatoes and yams, sugar cane, vegetables for northern markets, and fruits, especially peaches, strawberries and grapes. Livestock is represented mainly by beef cattle, swine and mules; dairying is increasing. Lumbering is extensive and important, the forest area being estimated at 30,000 square miles. Main manufactures are lumber and timber, cottonseed oil and cake, cotton goods, fertilizers, turpentine nd resin, canned fruits and vegetables.

Transportation and markets. Railroads are numerous, connecting with many of the great railway systems. The Mississippi River and its tributaries furnish important water communication as does the Gulf of Mexico through Gulfport, the principal port of entry; New Orleans, Louisiana, is an important market and shipping point for Mississippi.

History. The state is part of the Louisiana Territory. In 1539, De Soto crossed the northeastern part. In 1681–2, La Salle sailed down the Mississippi River to the Gulf, taking possession of the country in the name of the French crown and naming it Louisiana. In 1699, Iberville, with 200 French immigrants, established the first settlement near Biloxi, which was founded a dozen years later. In 1763, the French ceded the portion east of the Mississippi, except New Orleans, to the British. In 1798, Mississippi Territory was organized, embracing most of what is now southern Mississippi and Alabama. In 1817, Mississippi became a State, with its present limits. Ordinance of Secession passed January 9, 1861. Readmitted to the union, 1869. Capital, Jackson; population, 1910, 21,262. Mississippi has no really large cities, the largest being Meridian, 25,000, and Vicksburg, 20,000 (1910 figures).

Agricultural organization. Agricultural and Mechanical College and Experiment Station, *Agricultural College*. Branch stations at *Stoneville, Holley Springs, McNeill;* Alcorn Agricultural and Mechanical College, *Alcorn;* County Demonstration Agents, *Jackson;* Department of Agriculture and Commerce, *Jackson.* Livestock and Dairy Association, Horticultural Association, Hay Growers' Association, Farmers' Union, Nurserymen's Association, State Fair Association.

Statistics

1. Farms and Farm Property, 1910 and *1900*

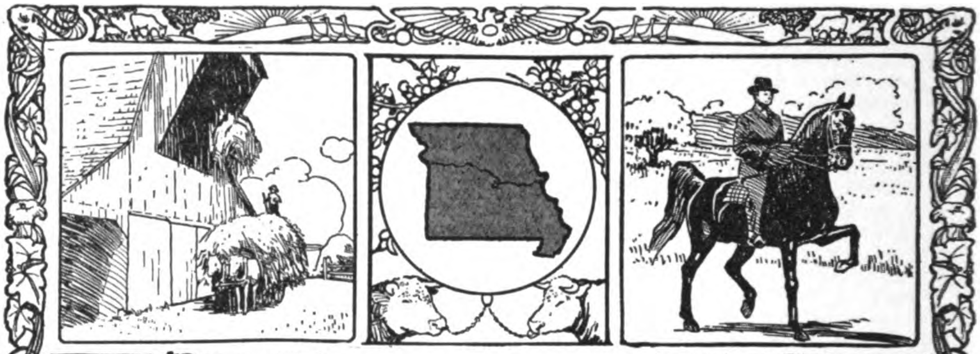
Population	1,797,114;	*1,551,270*
White	786,119	
Colored	1,009,487	
Other non-white	1,516	
(City, 207,311; country, 1,589,803)		
Number farmers	274,382	
(White, 109,645; non-white, 164,737)		
Land area, acres	29,671,680	
Acres in farms	18,557,533;	*18,240,736*
Acres farm land improved	9,008,310;	*7,594,428*
Average acres per farm	67.6 (32.8 acres improved)	
Farms by size:		
20 to 49 acres	112,666	
10 " 19 "	55,571	
50 " 99 "	44,645	
100 " 174 "	30,172	
3 " 9 "	11,132	
175 " 259 "	10,132	
Value farm property	$426,314,634;	*$204,221,027*
Per cent increase in 10 years	108.8	
" value of farm property in land	59.6	
" " " " " " buildings	18.8	
" " " " " " stock and tools	21.7	
Average value all property per farm	$1,554	
Average value land per acre	$13.69;	*$6.30*
Per cent of farms run by owners	33.6	
" " " " " tenants	66.1	
" " " " " managers	0.3	

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$147,315,621	
Value all cereals	26,864,772	
Corn, acres	2,172,612;	*4,100,000*
bushels	28,428,667;	*84,050,000*
value	$41,741,000;	*$115,989,000*
av. yield per acre (10 years), bushels	17.8	
Oats, acres	97,085;	*300,000*
bushels	1,268,785;	*5,700,000*
value	$1,848,000;	*5,358,000*
av. yield per acre (10 years), bushels	18.9	
Wheat, acres	394;	*14,000*
bushels	4,670;	*210,000*
value	$81,000;	*$630,000*
av. yield per acre (10 years), bushels	13.6	
Rice, acres	281;	*2,100*
bushels	4,836;	*63,000*
value	$59,000;	*$120,000*
av yield per acre (10 years), bushels	29.5	
Dry peas, acres	73,090; bushels,	285,768
Dry beans, acres	1,092; "	8,727
Peanuts, acres	13,997;	*4,000*
bushels	284,791;	*136,000*
value		*$184,000*
Value other grains and seeds	917,764	
Hay and forage, value	$3,363,647	
acres	229,705	
tons	279,236	
Value vegetables	$9,483,576	
Potatoes, acres	8,342;	*14,000*
bushels	644,742;	*1,092,000*
value		*$1,835,000*
Sweet potatoes and yams, acres	56,045;	*85,000*
bushels	4,427,988;	*5,525,000*
value		*$5,359,000*
Cotton, acres	3,400,210; bales,	1,127,156
	2,801,000; "	*895,000*
Sugar cane, acres	24,861	
tons	222,600	
sirup made, gallons	2,920,519	
Sorghum cane, acres	17,851	
tons	55,359	
sirup made, gallons	622,356	
Value fruits and nuts	$1,686,923	
Apples, trees	427,652; bushels,	265,841
		315,000
Peaches, nectarines, trees	1,726,298; "	1,156,817
		375,000
Pears, trees	118,556; "	101,288
		30,000
Plums, prunes, trees	257,140; bushels,	101,974
Cherries, trees	13,748; "	2,819
Grapes, vines	77,012; pounds,	760,563
Figs, trees	65,397; "	1,949,301
Oranges, trees	10,452; boxes,	3,779
Small fruits, acres	836; quarts,	1,407,301
Pecan, trees	60,524; pounds,	637,293

3. Livestock, 1910 and *1917*

Farms reporting domestic animals	250,963	
Value of domestic animals	$73,255,756	
Cattle, number	1,012,632; value,	$15,269,364
	985,000; "	*25,874,000*
Dairy cows, number	429,587;	
	450,000; "	*17,100,000*
Horses, number	216,220; "	20,303,850
	243,000; "	*21,141,000*
Mules, number	255,760; "	32,028,421
	292,000; "	*31,828,000*
Swine, number	1,292,119; "	4,913,166
	1,698,000; "	*12,735,000*
Sheep, number	195,245; "	416,716
	193,000; "	*579,000*
Goats, number	45,871; "	43,873
Poultry, number	5,070,116; "	1,846,751
Bees, colonies	74,350; "	144,226
Milk produced, gallons	79,079,293	
Butter produced, pounds	28,730,685	
Value dairy products	$6,033,465	
Value poultry products	5,965,035	
Value animals sold	5,519,990	
Value animals slaughtered	6,745,307	



MISSOURI

MISSOURI ("Fair Weather State"), one of the Corn Belt States, lies between 36 and 41 degrees north latitude and 89 and 95 degrees west longitude. The Mississippi River forms the entire eastern boundary; its greatest tributary, the Missouri, flows for about 150 miles on the western boundary, then crosses the central part of the state, entering the Mississippi north of St. Louis. Other tributaries of the Mississippi are the St. Frances and the White, in the southern part. The Grand and Chariton Rivers flow into the Missouri from the north, and the Gasconade and Osage from the south. Area, 69,430 square miles, 693 of which are water.

Land surface. There are three general regions: (1) the upland plains of the northern and western part; (2) the Ozark Plateau region comprising most of the southwestern third of the state, and (3) the southeastern lowlands bordering the Mississippi River. The first includes all north of the Missouri River, and a large area south of it bordering Kansas, most of which is a rolling prairie broken by small strips of timber along the streams. The Ozark Plateau rises gradually from the Mississippi River in the southeastern part toward the south central part of the state, where it reaches an elevation of 1,500 feet and continues into Arkansas and Alabama. The surface is broken and hilly, although there are wide stretches of comparatively level uplands. The southeastern lowlands comprise an old flood plain of the Mississippi River, and contain numerous cypress swamps, lakes and lagoons, although about half of this is now drained and in farms.

Soils. The soils of the Prairie section are a rich, black loam in the northwest, somewhat lighter farther east. There is much loess soil along the Missouri River, especially in the northwestern part of the state. The Ozark Plateau has a flinty, clay limestone soil of only moderate fertility. The bottom lands of the rivers are mostly fertile. The extreme southeast, which originally was swampy, is now about half drained and it is mostly very productive.

Climate. Being an inland state, Missouri is subject to considerable extremes, but periods of excessive heat and cold are of short duration. In the north, the average annual temperature is 52.6 degrees. Highest recorded temperature is 114 degrees at Jefferson City; lowest, 29 degrees below zero at Bethany and Liberty. The average frost-free season is about 170 days. In southeastern Missouri, the highest recorded temperature is 116 degrees at Marble Hill; lowest, 32 degrees below zero at Greenville. The average frost-free season is about 200 days in the lowlands in the southeast, and about 175 days on the plateau. In the southwest, the average annual temperature is about 56 degrees. Highest recorded temperature is 112 degrees at Harrisonville; lowest, 35 degrees below zero at Arthur. The average frost-free season is about 175 days. The average annual rainfall is about 40 inches, being a little heavier in the east than in the west. There is an average snowfall of about 20 inches at St. Louis, and about 10 inches on the southern boundary.

Opportunities. Missouri has no land subject to homestead entry, but there are thousands of acres of unimproved land—somewhat broken uplands, cut-over timber tracts, and reclaimed lowlands—which can be bought very reasonably. Drainage projects are extensive in the southeastern lowlands, particulars of which may be obtained from the Bureau of Labor Statistics, Jefferson City.

Products and industries. Of the important farm products, corn is far in the lead. Cotton is grown in the extreme southeastern part. Hay, both tame and wild, wheat and oats are other leading crops. Of fruits, apples, peaches, strawberries and grapes are the leaders. Large numbers of beef cattle are produced, and dairying is increasing rapidly.

Horses, mules, and swine are raised in large numbers, and poultry is an important product. Lumbering is still important in some of the counties south of the Missouri River. Leading minerals are lead, zinc and coal. Main manufactures are meat products, flour, tobacco, malt liquors, boots and shoes, lumber and timber products, clothing. Missouri leads the states west of the Mississippi River in the extent of manufactures. Chief industrial centers are St. Louis, Kansas City, St. Joseph, Hannibal and Joplin.

Transportation and markets. Railroad facilities are excellent in the northern and western parts of the state and in the southeast lowland, but fewer lines cover the Ozark region. St. Louis and Kansas City are among the most important railroad centers in the United States. There is a limited but increasing mileage of electric railways. The Mississippi and Missouri Rivers are important means of water communication. Most important grain and livestock markets are St. Louis, Kansas City and St. Joseph.

History. Earliest settlements at St. Genevieve about 1735, and St. Louis in 1764. With the Territory of Louisiana, ceded to Spain by the Treaty of Paris, 1763; remained a Spanish possession till 1800, when it was ceded back to France. Louisiana Territory purchased by the United States in 1803. Organized as Missouri Territory, 1812. Admitted to statehood, 1821. Many southern sympathizers during the Civil War, but Missouri remained in the Union. In 1904, the Louisiana Purchase Exposition was held at St. Louis to commemorate the 100th anniversary of the purchase of Louisiana. Capital, Jefferson City; population, 1910, 11,850.

Agricultural organization. The State University, College of Agriculture and Agricultural Experiment Station are located at *Columbia*. The College of Agriculture includes the Agricultural Extension Service and the Experiment Station, each with its own staff of workers in several departments. The Experiment Stations at *Mountain Grove* are independent of the University. The State Board of Agriculture is located at *Jefferson City*, as is also the Bureau of Labor Statistics.

Statistics

1. Farms and Farm Property, 1910 and *1900*

	1910	*1900*
Population	3,293,335	*3,106,665*
White	3,134,932	
Colored	157,452	
Other non-white	951	
(City, 1,398,817; country, 1,894,518)		
Number farmers	277,244	*284,886*
(White, 273,578; non-white, 3,666)		
Land area, acres	43,985,280	
Acres in farms	34,591,248	*33,997,873*
Acres farm land improved	24,581,186	*22,900,043*
Average acres per farm	124.8 (88.7 acres improved)	
Farms by size:		
100 to 174 acres	80,020	
50 " 99 "	74,178	
20 " 49 "	47,398	
175 " 259 "	32,109	
260 " 499 "	19,812	
10 " 19 "	10,740	
Value farm property	$2,052,917,488	*$1,033,121,897*
Per cent increase in 10 years	98.7	
" value of farm property in land	70.4	
" " " " " " buildings	13.2	
" " " " " " stock and tools	16.4	
Average value all property per farm	$7,405	
Average value land per acre	$41.80	*$20.46*
Per cent of farms run by owners	69.4	
" " " " " tenants	29.9	
" " " " " managers	0.7	

2. Crop Acreages, Yields, Values, 1910 and *1917*

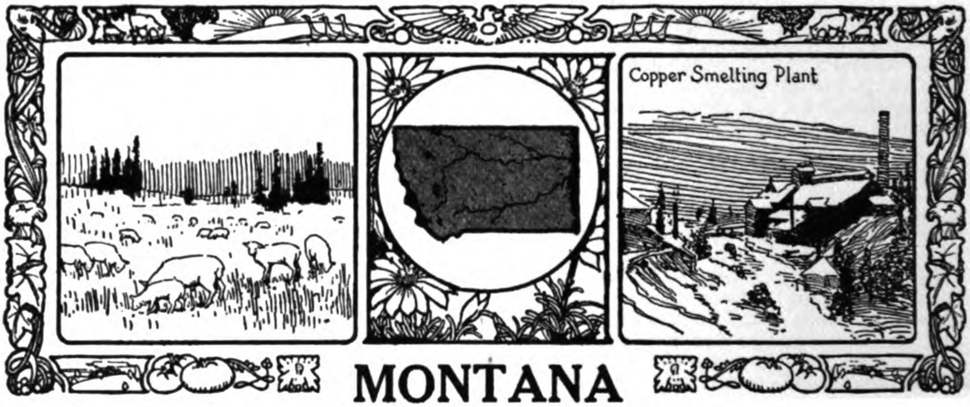
	1910	*1917*
Value all crops	$220,663,724	
Value all cereals	147,980,414	
Corn, acres	7,113,953	*7,200,000*
bushels	191,427,087	*252,000,000*
value	$120,516,000	*$287,280,000*
av. yield per acre (10 years), bushels	26.4	
Wheat, acres	2,017,128	*1,800,000*
bushels	29,837,429	*27,540,000*
value	$21,863,000	*$53,703,000*
av. yield per acre (10 years), bushels	13.5	
Oats, acres	1,073,325	*1,480,000*
bushels	24,828,501	*59,200,000*
value	$8,387,000	*$36,112,000*
av. yield per acre (10 years), bushels	24.3	
Rye, acres	20,001	*30,000*
bushels	205,813	*441,000*
value	$158,000	*$728,000*
av. yield per acre (10 years), bushels	14.1	
Kafir corn, acres	13,543; bushels, 228,386	
Dry peas, acres	23,036; " 109,357	
Flaxseed, acres	20,630	*6,000*
bushels	154,532	*51,000*
value		*$140,000*
Value other grains and seeds	$1,153,007	
Hay and forage, value	$33,845,094	
acres	3,628,348	
tons	4,091,342	
Value vegetables	13,305,829	
Potatoes, acres	96,259	*109,000*
bushels	7,796,410	*9,483,000*
value		*$12,992,000*
Sweet potatoes and yams, acres	7,938	*8,000*
bushels	876,234	*896,000*
value		*$1,263,000*
Tobacco, acres	5,433; pounds, 5,372,738	*3,000;* " *2,820,000*
Cotton, acres	96,527; bales, 54,498	*140,000;* " *51,000*
Sorghum cane, acres	45,088; tons, 201,206	
sirup made, gallons	1,788,391	
Value other crops	$15,506,692	
Value fruits and nuts	8,872,688	
Apples, trees	14,359,673; bushels, 9,968,977	*12,375,000*
Peaches, nectarines, trees	6,588,034; " 1,484,548	*890,000*
Pears, trees	606,973; " 142,547	*265,000*
Plums and prunes, trees	917,851; " 234,872	
Cherries, trees	622,332; " 123,314	
Grapes, vines	3,026,526; pounds, 17,871,816	
Small fruits, acres	17,009; quarts, 23,696,221	
Nuts, trees	153,244; pounds, 2,823,368	

3. Livestock, 1910 and *1917*

	Number	Value
Farms reporting domestic animals	270,637	
Value of domestic animals		$273,366,662
Cattle, number	2,561,482	$72,883,664
	2,445,000	*114,872,000*
Dairy cows, number	856,430	
	845,000	*49,432,000*
Horses, number	1,073,387	113,976,563
	1,040,000	*95,680,000*
Mules, number	342,700	43,438,702
	350,000	*36,400,000*

Swine, number	4,438,194;	value,	$31,937,573
	4,280,000;	"	*42,800,000*
Sheep, number	1,811,268;	"	7,888,878
	1,370,000;	"	*10,549,000*
Goats, number	72,415;	"	187,409
Poultry, number	20,897,208;	"	11,870,972
Bees, colonies	203,569;	"	584,549

Milk produced, gallons	188,297,972
Butter, produced, pounds	42,105,143
Value dairy products	$13,685,318
Value poultry products	31,669,494
Value animals sold	143,967,066
Value animals slaughtered	15,272,156



MONTANA ("Copper State"), a Western State, lies between 44 and 49 degrees north latitude, and 104 and 116 degrees west longitude. Its extreme dimensions are 315 miles north to south, and 580 miles from east to west. It ranks third in size among all the states, the area being 146,572 square miles, of which 796 are water.

Land surface. The main chain of the Rocky Mountains, with peaks reaching 8,000 to 11,300 feet, extends from Yellowstone Park (at about the middle of the southern border) northwest across the state. The country east of this, covering about two thirds of the state, is in the plains region, and consists mainly of rolling table lands varying from 4,000 feet above sea level at the base of the mountains to 2,000 feet in the northeast corner. This region is drained by the Missouri River formed by the junction of the Jefferson, Madison and Gallatin forks. The Bitter Root Mountains (7,000 to 8,000 feet high) lie along the state's southwestern boundary, and the western third of the state, between these and the Rockies, consists of a great basin drained by the Clark Fork of the Columbia River, with its two branches—the Missoula and the Flathead.

Soils. The southeastern part of the state consists largely of upland soils formed by the breaking down of underlying rock, and by the partial weathering of large deposits of sandy and gravelly loams which have been brought down from the western mountain region. In the western part, the soils of the broad valleys are dark-colored alluvial silts, and sandy loams; the bench lands and terraces bordering the valleys are sandy and gravelly, while those of the higher portion bordering the mountains have generally a good soil. The intensive farming is largely on the alluvial soils of the river valleys, much of it under irrigation, but even larger areas are cropped by dry-farming methods; the table lands are lighter and sandy, the best being good for dry-farming and all of them good for grazing. On the "bad lands," which are interspersed through the eastern portion of the state and mainly along the water courses, the soil is too steep for anything but grazing. Grain can be grown in most parts of the state without irrigation.

Climate. This is marked by great extremes of heat and cold, but is generally healthful. The varying altitudes, the mountain barriers and deep valleys which deflect air currents, the cold waves from the Canadian Northwest, and the warm Chinook winds from the Pacific, all combine to cause a great variety of climate, often sudden and extreme changes in temperature, and wide differences in prevalence of, or freedom from, severe storms. Temperatures as high as 117 degrees and as low as 65 degrees below zero have been recorded. The average annual temperature varies from 40 to 45 degrees in different locations. Average annual rainfall varies from 10 to 33 inches in different sections, and the average frost-free season from 50 to 150 days. The snowfall varies, also, but is usually heavy in most parts of the state.

Opportunities. About one third of the farms of the state are irrigated, and the number is being constantly increased. Information about farms available under the reclamation projects may be obtained from the U. S.

Reclamation Service, Washington, D. C. Dry-farming areas are being enlarged and crops thus grown are being increased annually. Experiments in irrigation by pumping from wells have been conducted by the Experiment Station.

Products and industries. Leading farm activities are the production of hay, spring wheat and oats. Apples are successfully grown. The leading livestock are sheep, in which Montana leads. Beef cattle and horses come next. Hogs and dairy cattle are increasing rapidly. Lumbering is carried on in the mountainous portions. Leading minerals are gold, silver, copper and lead, which form the greatest source of wealth in the state, and coal. Sapphires of unusual quality constitute the most valuable deposit of precious stones discovered in this country. Manufacturing has not been developed to any great extent, except the refining and smelting of copper and lead, but the available water power and extensive coal deposits give opportunity for almost unlimited development.

Transportation and markets. Being a new state, its railroads are not extensive. Three transcontinental lines, however, connect all important centers with the Pacific Coast and the east. The Oregon Short Line connects at Butte with Idaho and Utah and the states to the south, and the Burlington connects with the southeast. The Missouri River is navigable to Fort Benton and the Yellowstone to the mouth of the Big Horn.

History. First explored in 1742. In 1805, the Lewis and Clark expedition explored the Yellowstone and Missouri Rivers. Trading posts were established along the Yellowstone from 1809 to 1829. Fort Benton founded in 1846. Discovery of gold in 1852 led to the country's first development. The Montana region was organized in 1860–1 as Shoshone and Missoula Counties of Washington Territory. In 1863, Idaho and Montana were set off from Washington under the name of Idaho Territory. In 1864, Montana was established as a separate territory with the capital at Virginia City. In 1874 the capital was removed to Helena. The Northern Pacific Railway was completed in 1883. A constitution was adopted in 1884, and Montana was admitted to statehood in 1889.

Agricultural organization. College of Agriculture and Mechanic Arts, and Experiment Station, Coöperative Demonstration Work, all *Bozeman;* Horticultural Substation, *Corvallis;* Horticultural Society, *Missoula;* Fish and Game Protective Association, *Helena*. The State Fair is held at *Helena*.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population..........................376,053; *243,329*
 White..........................360,580
 Indian..........................10,745
 Other non-white..........................4,728
(City, 133,420; country, 242,633)
Number farmers..........................26,214; *13,370*
(White, 25,018; non-white, 1,196)
Land area, acres..........................93,568,640
Acres in farms..........................13,545,603; *11,844,454*
Acres farm land improved..........................3,640,309; *1,736,701*
Average acres per farm....516.7 (138.9 acres improved)
Farms by size:
 100 to 174 acres..........................10,552
 260 " 499 " 6,773
 500 " 999 " 2,353
 1000 acres and over..........................1,999
 175 to 259 acres..........................1,566
 50 " 99 " 1,260
Value farm property..........................347,828,770; *117,859,823*
Per cent increase in 10 years..........................195.1
 " value farm property in land..........................65.2
 " " " " " buildings..........................7.1
 " " " " " stock and tools....27.6
Average value all property per farm..........................$13,269
Average value land per acre..........................$16.74; *$4.45*
Per cent of farms run by owners..........................89.1
 " " " " " tenants..........................8.9
 " " " " " managers..........................1.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$29,714,563
Value all cereals		12,251,345
Oats, acres	333,195;	*680,000*
bushels	13,805,735;	*13,600,000*
value	$6,118,000;	*$11,016,000*
av. yield per acre (10 years), bushels		44.6
Wheat, acres	258,377;	*1,727,000*
bushels	6,251,945;	*17,963,000*
value	$9,081,000;	*$34,489,000*
av. yield per acre (10 years), bushels		24.8
Barley, acres	27,242;	*90,000*
bushels	753,268;	*1,350,000*
value	$903,000;	*$1,390,000*
av. yield per acre (10 years), bushels		33.4
Rye, acres	6,034;	*9,000*
bushels	111,214;	*114,000*
Flaxseed, acres	37,647;	*422,000*
bushels	447,484;	*1,266,000*
Dry peas, acres	1,184	
bushels	21,670	
Value other grains and seeds		$820,076
Hay and forage, value		12,344,606
acres		1,135,376
tons		1,692,656
Value vegetables		$2,227,736
Potatoes, acres	20,710;	*57,000*
bushels	3,240,696;	*5,415,000*
Sugar beets, acres	8,804	
tons	109,434	
Value other crops		$1,375,119
Value all fruits		695,681
Apples, trees	696,753; bushels,	567,054; *911,000*
Peaches and nectarines, trees	538; "	128
Pears, trees	10,297; "	7,543; *11,000*
Plums, prunes, trees	21,140; "	8,777
Cherries	19,938; "	7,497
Grapes, vines	986; pounds,	370
Small fruits, acres	562; quarts,	766,791

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		23,690
Value of domestic animals		$84,999,659
Cattle, number	943,147; value,	$27,474,122
	1,131,000; "	*63,889,000*
Dairy cows, number	77,527;	
	148,000; "	*11,692,000*
Horses, number	315,956; "	27,115,764
	452,000; "	*41,584,000*
Mules, number	4,174; "	445,278
	4,000; "	*428,000*
Swine, number	99,261; "	858,829
	269,000; "	*3,228,000*
Sheep, number	5,380,746; "	29,028,069
	3,744,000; "	*26,582,000*
Goats, number	5,045; "	22,416
Poultry, number	966,690; "	628,436
Bees, colonies	6,313; "	32,112
Milk produced, gallons		16,982,145

Butter produced, pounds	2,820,574
Value dairy products	$2,093,594
Value poultry products	1,884,111
Value animals sold	20,346,948
Value animals slaughtered	1,262,151

4. Irrigation, 1909 and *1899*

Number farms irrigated	8,970; *8,043*
Per cent of all farms irrigated	34.2
Acreage irrigated	1,679,084; *951,154*
Types of project and acreage:	
U. S. Reclamation Service	14,077
U. S. Indian Service	67,417
Carey Act Enterprises	9,648
Irrigation districts	412
Coöperative enterprises	333,926
Commercial enterprises	62,544
Individual and partnership enterprises	1,191,060

Per cent of crops grown under irrigation:
Corn, 17.2; oats, 47.9; wheat, 17.6; emmer and spelt, 10.8; barley, 34.0; rye, 14.4; alfalfa seed, 41.3; dry peas, 80.3; timothy and clover mixed, 66.8; alfalfa, 81.7; potatoes, 53.8; sugar beets, 85.8; small fruits, 47.0.

Yields	Irrigated	Non-irrigated
Corn, bushels	31.4	28.3
Oats, bushels	43.6	39.4
Wheat, bushels	27.1	23.6
Barley, bushels	29.5	26.7
Timothy, tons	1.56	1.37
Clover, tons	2.06	2.15
Alfalfa, tons	2.81	2.07
Potatoes, bushels	174.1	136.0

NEBRASKA ("Antelope State"), one of the North Central States, lies between 40 and 43 degrees north latitude, and 95 and 104 degrees west longitude. The Missouri River forms part of the northern and all of the eastern boundary. Area, 77,510 square miles, of which 702 are water surface.

Land surface. The state is largely a gently rolling plain, with a gradual upward slope from east to west. In the north and west are the foothills of the Rocky Mountains, ranging from 3,500 to 5,084 feet in height. In the Missouri Valley in the east, the elevation is less than 850 feet above sea level. The river valleys are mostly shallow and, in the case of the larger rivers, very broad.

Soils. These are largely loess. Most of the northern two thirds of the state has a dark-brown silt loam soil, very fertile and adapted to corn, oats and grass. Some of the river valleys are timbered and their soil is darker and adapted to grass and wheat. The southern part consists largely of a gray silt loam adapted to fruits, especially apples, and general farm crops. Along the streams the soil is largely alluvial and very fertile. Through the north central part run the Sand Hills, and west of this the high plains country adapted to dry-farming.

Climate. The winters are usually severe and the summers hot, but on account of the dry atmosphere, these extremes are not so severely felt as in a moister climate. Temperatures and rainfall vary widely in different sections. In southern Nebraska, the average annual temperature is about 50 degrees; the average frost-free season about 160 days; and the average annual rainfall from about 32 inches in the eastern to 16 inches in the western part. In the northeastern section, the average annual temperature is about 48; the average frost-free season 150 days; and the average annual rainfall decreases from 30.5 inches in the eastern portion to 22.5 in the western. In the northwestern section, average annual temperature is 47 degrees; the frost-free season only about 132 days; and the average annual rainfall about 20 inches. The snowfall varies with the season from almost nothing in certain years to about 24 inches in the east, to 30 inches in the west in years of heavy snowfall. Considerably more than half the days of the year are clear, and relatively few are rainy.

Opportunities. In the western half of Nebraska, the climate and the land are ideal for irrigation, and the entire valley of the North Platte will, in a few years, be under canals leading from the great Pathfinder reservoir in the Wyoming mountains. The two largest ir-

rigation projects are the Interstate Canal and the Fort Laramie Canal. Both derive their waters from the Pathfinder Reservoir. The Interstate Canal irrigates about 150,000 acres on the north side of the Platte in Nebraska. The Fort Laramie Canal, under construction, will irrigate about 80,000 acres. Both of these were constructed by the United States Government. Besides these larger projects, are several hundred smaller ones with an aggregate of over 600,000 acres subject to irrigation and the prospect that ultimately 1,000,000 acres will be brought under irrigation. Information may be obtained from the Reclamation Seıvice, Washington, D. C. The Niobrara National Forest Reserve is in Cherry County, 123,779 acres. Bessey National Forest Reserve in Thomas County, 85,123 acres.

Products and industries. Nebraska is preeminently an agricultural state. Leading farm activities are the production of cereals and livestock. Corn is the leading cereal, exceeding all others in acreage and value. It is grown most largely in the east, and much of it is fed on the farms to range cattle, sheep and swine. Winter wheat is extensively grown. Barley, oats, emmer and spelt are grown throughout the state, and durum wheat in the west. Immense quantities of hay and forage are produced, and potatoes are important. Apples and grapes are the leading fruits in the eastern counties. Large areas of sugar beets are grown in the irrigated sections. Cattle lead in value of farm animals, followed by horses, swine and mules; poultry exceed sheep in value. Manufacturing is developing rapidly; main lines are meats; flour and other cereal products; butter, cheese and condensed milk; railroad cars; lumber and timber products; leather goods, and clothing. The leading manufacturing city is Omaha.

Transportation and markets. The state is fairly well covered by railroads. Omaha is a port of entry, the leading market city and the seat of the slaughtering and packing industry.

History. Nebraska belonged to that part of the Louisiana Purchase which, in 1804, was organized as the Territory of Louisiana and, after 1812, was known as Missouri Territory. Some explorations were made by the Lewis and Clark expedition in 1804–6. First permanent settlement was a trading post at Bellevue, about 1823. Fort Atkinson was established in 1819, abandoned in 1827; Omaha was settled in 1850, and Nebraska City in 1847. In 1854, Congress passed a bill organizing the territory north of 40 degrees north latitude as Nebraska Territory. After numerous boundary changes, the state was admitted to the Union in 1867. In 1898, the Trans-Mississippi Exposition was held at Omaha.

Agricultural organizations. College of Agriculture and Experiment Station, Coöperative Demonstration Work, *Lincoln;* Board of Agriculture, State Horticultural Society, Dairymen's Association, Poultry Association, Corn Improvers' Association, Improved Live Stock Breeders' Association, all *Lincoln.* Each of the above associations receives appropriations from the State Treasury for its work. Live Stock Sanitary Board, Food, Drug, Dairy and Oil Commission, *Lincoln.* State Fair held permanently at *Lincoln.*

The Experiment Station Director reports that the most decided tendency and progress along agricultural lines in Nebraska is in the field of economic distribution. About 50,000 farmers are members of associations whose functions include coöperative buying and selling. In the field of production, the most pronounced features of progress are five: (1) The development in the western part of Nebraska of an extensive commercial potato industry, both under irrigation and dry-farming, which has more than doubled the product within a few years and greatly enlarged the possibilities of that region. (2) The construction of 2 new beet-sugar factories in the irrigated district of western Nebraska, involving an expenditure of several million dollars and signifying the permanence of sugar beets as a staple product of that section. (3) The practical end of the public land period in Nebraska by the homesteading of almost the last acreage in the Sand Hill section under the 640-acre homestead law. (4) The sudden development of the manufacture of potash from alkali lakes in the Sand Hill region; these lakes have suddenly been discovered to be worth millions of dollars, and within a year probably $5,000,000 of capital went into their development; dividends running as high as 1,000 per cent have been paid upon these investments. (5) The sudden rise of oat production which has become one of the major industries of Nebraska, due to extensive killing of winter wheat and planting of large acreage to oats in 1917, which gave phenomenal returns in both yield and price.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,192,214; *1,066,300*
White	1,180,293
Colored	7,689
Indian	3,502
Other non-white	730
(City, 310,852; country, 881,362)	
Number farmers	129,678; *121,525*
(White, 129,216; non-white, 462)	
Land area, acres	49,157,120
Acres in farms	38,622,021; *29,911,779*
Acres farm land improved	24,382,577; *18,432,595*
Average acres per farm	297.8 (188 acres improved)
Farms by size:	
100 to 174 acres	43,916
260 " 499 "	26,490
175 " 259 "	20,743
500 " 999 "	13,128
50 " 99 "	12,618
1,000 acres and over	3,867
Value farm property	$2,079,818,647; *$747,950,057*
Per cent increase in 10 years	178.1
" value of farm property in land	77.6

Per cent value of farm property in buildings		9.6
" " " " " " stock and tools		12.8
Average value all property per farm		$16,038
Average value land per acre	$41.80;	*$16.27*
Per cent of farms run by owners		61.1
" " " " " tenants		38.1
" " " " " managers		0.8

2. Crop Acreages, Yields, Values, 1910 and *1917*

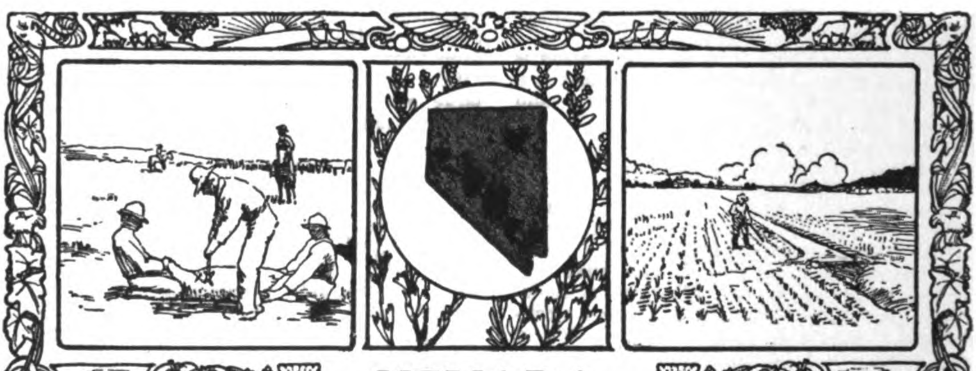
Value all crops			$196,125,632
Value all cereals			153,666,652
Corn, acres	7,266,057;		*9,240,000*
bushels	180,132,807;		*249,480,000*
value	$88,234,846;		*$299,376,000*
av. yield per acre (10 years), bushels			24.2
Oats, acres	2,365,774;		*3,038,000*
bushels	53,360,185;		*115,444,000*
value	$19,443,570;		*$70,421,000*
av. yield per acre (10 years), bushels			26.0
Wheat, acres	2,662,918;		*997,000*
bushels	47,685,745;		*13,764,000*
value	$44,225,930;		*$26,840,000*
av. yield per acre (10 years), bushels			17.6
Barley, acres	113,571;		*213,000*
bushels	1,987,516;		*5,644,000*
value	$870,846;		*$5,531,000*
av. yield per acre (10 years). bushels			21.6
Emmer and spelt, acres			65,681
bushels			1,221,975
Rye, acres	62,827;		*215,000*
bushels	660,631;		*3,354,000*
Value other grains and seeds			$583,558
Hay and forage, value			$31,729,691
acres			4,520,034
tons			5,776,475
Value vegetables			5,931,738
Value other crops			1,976,484
Potatoes, acres	111,151,	bushels,	8,117,775
	147,000;	"	*12,495,000*
Sugar beets, acres	4,191;	tons,	39,874
Sorghum cane, acres			4,034
tons			10,447
sirup made, gallons			14,644
Value fruits and nuts			2,237,509
Apples, trees	2,937,178,	bushels,	3,321,073
			2,400,000
Peaches, nectarines, trees	1,188,373;	"	110,180
Pears, trees	59,285;	"	6,700
			14,000
Plums and prunes, trees	351,321;	"	41,910
Cherries, trees	494,468;	bushels,	89,876
Grapes, vines	1,221,736;	pounds,	4,752,217
Small fruits, acres	1,411;	quarts,	1,594,421
Nuts, trees	79,090;	pounds,	384,325

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			126,649
Value of domestic animals			$217,849,050
Cattle, number	2,932,350;	value,	$73,074,057
	3,025,000;	"	*150,029,000*
Dairy cows, number	613,952;	"	20,029,378
	676,000;	"	*45,968,000*
Horses, number	1,008,378;	"	102,804,907
	1,018,000;	"	*96,710,000*
Mules, number	83,405;	"	10,374,076
	112,000;	"	*11,872,000*
Swine, number	3,435,724;	"	29,649,482
	4,309,000;	"	*60,326,000*
Sheep, number	293,500;	"	1,486,948
	381,000;	"	*2,858,000*
Goats, number	3,290;	"	11,945
Poultry, number	9,351,830;	"	4,219,158
Bees, colonies	45,625;	"	152,676
Milk produced, gallons			160,610,359
Butter produced, pounds			25,986,931
Value dairy products			$10,566,275
Value poultry products			12,687,358
Value animals sold			100,784,287
Value animals slaughtered			5,293,468

4. Irrigation, 1909 and *1899*

Number farms irrigated	1,852
Per cent of all farms irrigated	1.4
Acreage irrigated	255,950
Types of project and acreages:	
U. S. Reclamation Service	30,536
U. S. Indian Service	300
Irrigation districts	76,448
Coöperative enterprises	78,605
Commercial enterprises	24,834
Individual and partnership enterprises	45,227
Yields on irrigated land:	
Corn, bushels	26.2
Oats, bushels	29.5
Wheat, bushels	19.0
Barley, bushels	25.8
Alfalfa, tons	2.55
Potatoes, bushels	146.3
Sugar beets, tons	11.83



NEVADA

NEVADA ("Sagebrush State"), one of the western mountain states, lies between 35 and 42 degrees north latitude, and 114 and 120 degrees west longitude. The Colorado River forms the southeastern boundary for about 150 miles. Aside from this river, the streams of the state mostly disappear in the sands, or flow into lakes with no visible outlets, some of which are salty or alkaline.

Land surface. Nearly the whole state is in the tableland known as the Great American Basin, with an average elevation of

4,000 to 5,000 feet. This is included between the Wasatch Mountains on the east and the Sierra Nevadas on the west. The basin is crossed from north to south by parallel ridges of mountains, some with elevations of 6,000 feet above the general level of the plateau; the highest elevation in the State is Wheeler Peak, 13,058 feet above sea level. The ridges are separated by long, narrow valleys. Parts of these valleys are alkaline deserts. The remainder are covered with sagebrush interspersed with native grasses which afford grazing for about 500,000 cattle and 1,500,000 sheep. The latter, comprising perhaps 70 per cent. of the valley area, offer greater or less promise of ultimate reclamation.

Soils. These, for the most part, are alluvial, sandy or gravelly loams deposited in the valleys by mountain erosion, and to a lesser degree, by the streams. In the ancient Lake Lahontan basin, the soils are in part volcanic ash intermixed with clays, and loams deposited as lake sediment. Soils covered with sagebrush are usually rich in plant foods, and are very productive under irrigation.

Climate. There is a wide range in temperature between the elevated northern part and the sub-tropical southern part. Wide daily ranges of temperature are experienced, due to lack of atmospheric humidity; the nights, as a rule, even in the hottest weather, are cool. Records of 39 degrees below zero have been recorded at Beowawe and of 117 degrees at Logan, in southern Nevada, but these may be regarded as exceptions. Northeastern Nevada has a somewhat severer winter climate than the central and western parts where comparatively mild winters prevail. In parts of southern Nevada, zero weather is unknown and freezing weather rare. Average annual temperatures range from 45.5 degrees in the northern section, to 64.9 degrees in the southern. Although instances of killing frosts in the north have been recorded in almost every month in the year, the normal growing season of crops is about 5 months, and the loss from frost is unimportant. The average rainfall, principally snow in winter, is less than 10 inches. As a whole, the climate is temperate, extremely dry, and healthful and invigorating.

Opportunities. Agricultural opportunities are presented in the settlement of the U. S. Truckee-Carson Reclamation Project, at Fallon; in the subdivision of the large irrigated ranches; and in homesteading arable public lands. Improved farm lands range in value from $75 to $300 per acre. Information about these lands may be obtained from the Agricultural Extension Division, Experiment Station, Reno.

Products and industries. Nevada is popularly regarded as strictly a mining state. Agriculture, however, has advanced so rapidly in recent years that, in 1917, an agricultural production in excess of $40,000,000 almost equaled the mineral production. Forage crops combined with livestock represent the ordinary type of farming. The sugar-beet industry has been successfully established with 1 large factory in operation. Dairying is increasing. While the hardy fruits are grown in northern Nevada, little attention is given to orcharding. In southern Nevada, the cantaloupe industry has developed to some proportions, and almonds, figs, pomegranates, grapes and other tender fruits are profitably grown. Potatoes are an important crop, the only one exported in any quantity. Gold, silver, copper, lead, zinc, tungsten and mercury are the most important minerals. Manufacturing is limited to foundry, machine-shop, flour, lumber, planing-mill and dairy products.

Transportation and markets. The state is traversed by three transcontinental railroad systems. Branch and local lines reach most of the settled portions. Farm crops, for the most part, are converted into livestock products which are exported to the Pacific Coast markets.

History. John C. Fremont led an exploring party through Nevada in 1843–4, and the first settlements were made by the Mormons in the valley of the Carson River, 1849. By the treaty of Guadalupe Hidalgo, which closed the Mexican War, the territory became a part of the U. S. in 1848. The region between 37 and 45 degrees north latitude and extending westward from the Rocky Mountains to California, was organized as Utah Territory in 1850, and in 1861, the territory of Nevada was organized. In 1864, this was admitted to statehood. Because of the decline in silver mining, the population of the state decreased during the latter part of the last century, but has recovered since. Population in 1917, estimated, 105,000. Capital, Carson City; population, 1910, 2,466.

Agricultural organization. The College of Agriculture, University of Nevada, *Reno*, comprises the Agricultural Extension Division, Agricultural Experiment Station, and Animal Disease Control Service. The State Fair is held annually at *Fallon*. County organizations comprise farm bureaus, county agricultural agents, home demonstrators and boys' and girls' club leaders, under direction of the Extension Division.

The Experiment Station Director reports that the state is awakening to the importance of developing its agricultural resources. All the water of the streams flowing during the crop-growing season is appropriated and used in the irrigation (in 1917) of approximately 900,000 acres of improved lands. Water-storage systems have been constructed or are proposed for the conservation of the flood waters of the streams, which will ultimately add about 500,000 acres or more to the farm acreage. Artesian water is found abundantly in many valleys, and is being utilized for irri-

gation. In the higher valleys of northeastern and eastern Nevada, experiments in dry-farm reclamation have been successful where the proper methods have been employed. Demonstrations are being conducted by the Extension Division at Metropolis, Elko county, to establish that, under the 640-acre grazing homestead act of Congress, several million acres of sagebrush lands may be reclaimed with drought-resistant forage crops for sheep.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	81,875; *42,335*
White	74,276
Indian	5,240
Other non-white	2,359
(City, 13,367; country, 68,508)	
Number farmers	2,689; *2,184*
(White, 2,528; non-white, 161)	
Land area, acres	70,285,440
Acres in farms	2,714,757; *2,565,647*
Acres farm land improved	752,117; *572,946*
Average acres per farm	1,009.6 (279.7 acres improved)
Farms by size:	
100 to 174 acres	555
50 " 99 "	411
260 " 499 "	366
1,000 acres and over	344
20 to 49 acres	320
500 " 999 "	248
Value farm property	$60,399,365; *$28,673,835*
Per cent increase in 10 years	110.6
" value of farm property in land	58.4
" " " " " " buildings	7.2
" " " " " " stock and tools	34.4
Average value all property per farm	$22,462
Average value land per acre	$12.99; *$5.17*
Per cent of farms run by owners	80.9
" " " " " tenants	12.4
" " " " " managers	6.7

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$5,923,536
Value all cereals		923,763
Wheat, acres	14,260;	*41,000*
bushels	396,075;	*1,140,000*
value	$1,074,000;	*$2,052,000*
av. yield per acre (10 years), bushels		29.0
Barley, acres	12,200;	*12,000*
bushels	412,149;	*480,000*
value	$228,000;	*$500,000*
av. yield per acre (10 years), bushels		40.6
Oats, acres	7,853;	*14,000*
bushels	334,973;	*560,000*
value	$165,000;	*$538,000*
av. yield per acre (10 years), bushels		44.1
Corn, acres	585;	*2,000*
bushels	20,779;	*60,000*
value		*90,000*
av. yield per acre (10 years), bushels		32.8
Value other grains and seeds		$3,988
Hay and forage, value		$4,185,071
acres		350,538
tons		521,918
Value vegetables		$661,803
Value other crops		46,100
Value fruits and nuts		102,811
Apples, trees	74,454; bushels,	74,449 / *192,000*
Peaches, nectarines, trees	6,329; "	3,171 / *6,000*
Pears, trees	3,946; "	4,083 / *6,000*
Plums, prunes, trees	6,716; "	3,857
Cherries, trees	1,588; "	481
Grapes, vines	26,607; pounds,	376,205
Small fruits, acres	37; quarts,	50,287
Nuts, trees	972; pounds,	10,250
Figs, trees	525; "	29,270

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		2,548
Value of domestic animals		$19,071,809
Cattle, number	449,681; value,	$9,766,723
	496,000; "	*20,541,000*
Dairy cows, number	17,084;	
	96,000; "	*1,976,000*
Horses, number	68,453; "	3,770,402
	73,000; "	*5,548,000*
Mules, number	2,786; "	233,800
	3,000; "	*255,000*
Swine, number	23,160; "	151,851
	37,000; "	*407,000*
Sheep, number	1,154,795; "	5,101,328
	1,455,000; "	*11,931,000*
Goats, number	4,849; "	11,710
Poultry, number	133,217; "	93,668
Bees, colonies	8,401; "	48,453
Milk produced, gallons		4,356,555
Butter, produced, pounds		403,885
Value dairy products		$518,179
Value poultry products		321,799
Value animals sold		4,339,040
Value animals slaughtered		423,193

4. Irrigation, 1909 and *1899*

Number farms irrigated	2,406
Per cent of all farms irrigated	89.5
Acreage irrigated	701,833
Types of project and acreages:	
U. S. Reclamation Service	30,000
U. S. Indian Service	2,597
Coöperative enterprises	78,966
Commercial enterprises	8,864

Per cent of crops grown under irrigation:
Corn, 91.6; oats, 92.8; wheat, 98.2; barley, 97.1; timothy, 69.8; rye, 48.8; alfalfa, 99.7; potatoes, 96.9; small fruits, 59.5.

Typical yields on irrigated land:	
Corn, bushels	35.6
Oats, bushels	42.2
Wheat, bushels	28.0
Barley, bushels	33.9
Timothy, tons	1.55
Alfalfa, tons	2.64
Potatoes, bushels	154.6
Timothy and clover, mixed, tons	1.65

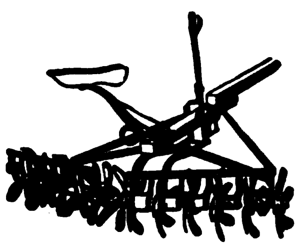


FIG. 373. Cutaway disc harrow

NEW HAMPSHIRE

NEW HAMPSHIRE ("Granite State"), one of the New England States, lies between 42 and 46 degrees north latitude, and 70 and 73 degrees west longitude. The Connecticut River and Hall's Stream, a small tributary, form the entire western boundary, and the Salmon Falls and Piscataqua River the southeastern. The largest river is the Merrimac, draining the central part of the state and flowing south into Massachusetts before emptying into the Atlantic Ocean. The northeastern part is drained by the Androscoggin River. Area, 9,341 square miles, of which 310 square miles are water surface.

Land surface. A mountainous area crosses the state from northeast to southwest, nearly parallel with the western border. The height varies from 1,500 feet in the south to 4,000 feet in the north. West of this is the Connecticut River basin. The southeast part within 25 miles of the coast is mainly level, with only occasional hills. The plateau region of the White Mountains, with an average elevation of 1,600 to 1,800 feet, occupies the north central part. It is traversed by several deep, narrow valleys, and includes more than 200 peaks, the highest and best known being Mount Washington, 6,293 feet, the highest point in northeastern United States. South of the White Mountains, the general elevation is less than 600 feet. The rough upland country is dotted with many lakes of which the largest, Winnepesaukee, is famous as a summer resort and for the beauty of its scenery.

Soils. The rocky soils of the higher land are glacial and strong in mineral matter, but tend to be thin and, in many places, unproductive as a result of poor treatment. Through the southern part of the state, especially towards the coast, they are much lighter and even sandy. The Connecticut River valley bottom and the land along the smaller streams is of a loamy or silty nature, uniform and fertile.

Climate. The climate is severe but not subject to sudden changes; in the mountains it is generally considered very healthful. The different altitudes show wide differences in temperature. At Manchester, in the south central part, the range is from 21 degrees below zero to 96 above. In the north, the temperature sometimes falls to 40 degrees and more below zero. The average annual rainfall is about 50 inches. The snowfall is heavy and the winters are long. The average frost-free season is about 130 days.

Opportunities. Information about locations suitable for farming or gardening may be obtained from the Experiment Station at Durham.

Products and industries. The leading farm activity is general farming, with dairy cattle and sheep as the important livestock features, and hay (most of which is fed on the farms) as the most important crop. Fruits (with apples leading) and vegetables are grown chiefly for local consumption, especially to supply summer resorts. Small fruits, market gardening and greenhouse gardening are receiving more attention, especially in the Merrimac River Valley. Some tobacco is raised along the Connecticut, but less than in the states to the south. While Boston and the summer resorts and factory towns in the southern part of the state provide good markets for most farm products, the short growing season, rocky soil, rough hilly surface and small fields have prevented farming from attaining any great development in the state. Chief minerals are granite and mica. Main manufactures are cotton and woolen goods, boots and shoes, paper and wood pulp, lumber and timber products, wooden packing boxes, flour and leather. Leading manufacturing cities are Manchester, Portsmouth, Concord, Nashua, Dover, Berlin, Rochester, Laconia, Keene.

Transportation. Railroad facilities supplied by the Boston and Maine and Grand Trunk lines are sufficient to meet the needs of tour-

ists and the larger, better located farms, but there is a good deal of farm country that can reach the main lines of traffic only by means of rough, hilly, country roads. The scenery is constantly attracting automobile traffic, however, and this is naturally resulting in road improvement.

History. New Hampshire was first explored by Sir Martin Pring in 1603. It was included in the First Charter of Virginia of 1606, the grant given to the Plymouth Company in 1620, and in a grant of 1622 made to the Council for New England to Mason and Gorges. In 1629, Mason secured an individual claim to the territory between the Merrimac and the Piscataqua Rivers, extending 60 miles inland along the course of each, and he named it New Hampshire after his native English country. In 1635, the New England Council confirmed this grant and added 10,000 acres to it. After his death, the affairs of the colony were in such a state that it was finally placed under the protection of Massachusetts, 1641. In 1675, Robert Mason, a grandson of the original proprietor, obtained a royal decree under which, in 1680, a separate Colonial government was established. After a century of dispute, the Mason claims were purchased by a land company, but boundary lines were in dispute till 1894. Early in 1775, New Hampshire declared for Independence, and was the first of the Colonies to adopt a state constitution. In 1783, it passed an ordinance freeing its slaves, and in 1788, ratified the Federal Constitution. Capital, Concord; population, 1910, 19,632.

Agricultural organization. College of Agriculture and Mechanic Arts and Experiment Station, *Durham*. Commissioner of Agriculture, *Concord*. Dairymen's Association, Horticultural Society, Potato Growers' Association, Sheep Breeders' Association, State Grange.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	430,572; *411,588*
White	429,906
Colored	564
Other non-white	102
(City, 255,099; country, 175,473)	
Number farmers	27,053; *29,324*
(White, 27,038; non-white, 15)	
Land area, acres	5,779,840
Acres in farms	3,249,458; *3,609,864*
Acres farm land improved	929,185; *1,076,879*
Average acres per farm	120.1 (34.3 acres improved)
Farms by size:	
50 to 99 acres	6,248
100 " 174 "	6,247
20 " 49 "	4,509
175 " 259 "	2,964
3 " 9 "	2,357
10 " 19 "	2,146
Value farm property	$103,704,196; *$85,848,096*
Per cent increase in 10 years	20.8
" value farm property in land	42.9
" " " " " buildings	39.9
" " " " " stock and tools	17.2
Average value all property per farm	$3,833
Average value land per acre	$13.70; *9.83*
Per cent of farms run by owners	90.5
" " " " " tenants	6.9
" " " " " managers	2.5

2. Crop Acreages, Yields, Values, 1910 and *1916*

Value all crops		$15,976,175
Value all cereals		879,631
Corn, acres	19,814;	*26,000*
bushels	916,263;	*1,092,000*
value	$800,000;	*$2,370,000*
av. yield per acre (10 years), bushels		42.0
Oats, acres	10,860;	*14,000*
bushels	386,419;	*532,000*
value	$282,000;	*$447,000*
av. yield per acre (10 years), bushels		35.8
Buckwheat, acres	1,052;	*2,000*
bushels	26,312;	*38,000*
value	$33,000;	*$70,000*
av. yield per acre (10 years), bushels		26.1
Barley, acres	848;	*1,000*
bushels	20,764;	*31,000*
value	$40,000;	*$54,000*
av. yield per acre (10 years), bushels		26.9
Rye, acres	260; bushels,	4,534
Wheat, acres	70; "	1,311
Dry beans, acres	3,180; "	22,546
Value other grains and seeds		$66,707
Hay and forage, value		7,846,143
acres		529,817
tons		582,454
Value vegetables		$2,276,177
Potatoes, acres	17,370; bushels,	2,360,241
	21,000; "	*2,247,000*
Value other crops		$4,065,765
Value fruits and nuts		841,752
Apples, trees	1,240,885; bushels,	1,108,424
		1,035,000
Peaches, nectarines, trees	57,571; "	23,218
		47,000
Pears, trees	36,816; "	24,224
		19,000
Plums, prunes, trees	23,152; "	7,542
Cherries, trees	9,463; "	1,403
Grapes, vines	15,802; pounds,	375,164
Small fruits, acres	618; quarts,	998,244
Nuts, trees	10,188; pounds,	254,521
Maple trees		792,147
sugar made, pounds		558,811
sirup made, gallons		111,500

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		23,583
Value of domestic animals		$11,237,764
Cattle, number	167,831; value,	$5,240,122
	160,000; "	*8,441,000*
Dairy cows, number	101,278	
	97,000; "	*6,450,000*
Horses, number	46,229; "	5,266,389
	44,000; "	*5,940,000*
Mules, number	195; "	29,681
Swine, number	45,237; "	504,174
	53,000; "	*827,000*
Sheep, number	43,772; "	192,346
	35,000; "	*234,000*
Poultry, number	924,859; "	694,121
Bees, colonies	4,644; "	23,593
Milk produced, gallons		35,033,153
Butter produced, pounds		5,065,188
Value dairy products		$5,589,711
Value poultry products		2,675,045
Value animals sold		3,482,591
Value animals slaughtered		847,159

NEW JERSEY

NEW JERSEY ("Blue Hen State"), one of the North Atlantic States, lies between 38 and 42 degrees north latitude, and 73 and 76 degrees west longitude. The extreme length of the state is 160 miles, width, 70 miles, area, 8,224 square miles, 710 miles of which are water.

Land surface. New Jersey is very irregular in outline, greatly diversified in surface and soil, and admirably adapted for growing, somewhere within its border, almost every temperate-climate product. Southern New Jersey is in the Coastal Plain region, level or gently rolling. The highest point of the watershed is less than 400 feet, while most of the region is less than 100 feet above sea level. The slope is toward the Atlantic Ocean and the Delaware River. The coast is made up of narrow, sandy beaches, tide marshes, inlets, shallow bays and sounds. The northern part is in the Appalachian Highland, attaining a height of 1,800 feet on the northern border. Many of the higher elevations are rocky and bare, others are wooded, the intervening valleys varying from narrow chasms to broad intervales of fertile soil. It has many small and rapid streams and clear lakes. Between and merging into these two main regions is the Red Sandstone Plain extending across the state.

Soils. Through the center of the state, the soil is mostly a red shale or clay marl, admirably adapted for general crops and mixed farming. In the north, the soil in the valleys is alluvial and fertile, on the hills rocky and thinner, but well adapted for tree fruits and grazing. The southern part is in general sandy with heavier fertile soil along the western border, with areas of marshy land suitable for cranberries. In the pine region in the center of this section, the soil is lighter, but when cleared, well adapted for small fruits.

Climate. In the south, the climate is modified by the Ocean and Delaware Bay, and is very equable; zero temperatures and those above 100 degrees are rare. The average annual temperature is about 53.5 degrees, and the frost-free season about 180 days. In the north, the temperature runs lower in winter and higher in summer. The frost-free season averages about 150 days. Here the average annual rainfall is about 48 inches; in the south, it is somewhat less with the lowest on the coast from Cape May to Atlantic City. The average annual snowfall in the north ranges from 31 to 34 inches; in the south, less than 20 inches.

Opportunities. There is no untaken public land. Many farms, once under cultivation, are neglected or temporarily untilled, which, by the proper use of commercial fertilizers and green manures, could be improved and made fairly productive, and, in many instances, could be bought for less than the cost of the buildings. In middle and north Jersey, many thousands of acres are now untilled, and good farms may be bought at a very moderate price. The growth of the home markets, the nearness of the large consuming centers in New York and Pennsylvania, the excellent roads and fine transportation facilities, make New Jersey an attractive field for agricultural development. The State Board of Agriculture, Trenton, helps prospective settlers to find farms. Information on the quality of the soils and their value for different types of farming may be had from the Agricultural Experiment Station, New Brunswick.

Products and industries. Leading farm activities through the central part of the state are the production of general farm crops, corn and oats being the leading grains. Potatoes are largely grown in the south central part, and sweet potatoes farther south and west. Vegetables of all kinds for the city markets are grown in immense quantities, and fruits of every kind are raised commercially. Peaches lead in the northwest

and are also grown toward the south. Apples are grown largely in the north and in the south central part; pears, plums and grapes in the south, and small fruits in most of the state. In cranberries, New Jersey leads all other states. Gardening and flower growing under glass are important industries. Dairying and poultry are the leading livestock industries. In fisheries, New Jersey leads the Middle Atlantic States, oysters and clams forming the larger part of the product. There is considerable lumbering, largely from second growth. The leading mineral is iron ore. Main manufactures are silks (in which New Jersey surpasses all other states), felt hats, cotton and woolen goods, petroleum products, iron and steel, leather, malt liquors, meat products, electrical apparatus and supplies, chemicals, clay products, wire, rubber goods, jewelry, tobacco products, boots and shoes, glass. Leading manufacturing cities are Newark, Jersey City, Bayonne, Paterson, Perth Amboy, Camden, Trenton, Elizabeth and Passaic.

Transportation and markets. New Jersey excels all other states in railroad mileage in proportion to its size. The rivers and bays about the state furnish excellent facilities for local water transportation, and electric railway mileage is large. New York and Philadelphia, on either side, furnish markets for every kind of product, and are supplemented by the many cities and towns, and summer and seashore resorts within the state.

History. First visited by Gomez in 1524. Settlements by the Swedes along the Delaware and the Dutch in the northeast early in the seventeenth century. Hoboken was settled in 1640. In 1774, the first provincial congress of New Jersey met at New Brunswick, and a state constitution was adopted in 1776. New Jersey was the third state to ratify the Federal constitution. Trenton (population, 1910, 96,815) made permanent capital in 1790.

Agricultural organization. College of Agriculture and Mechanic Arts and Experiment Station, and County Demonstration Work, *New Brunswick*. State Board of Agriculture, *Trenton*. State Horticultural Society, State Poultry Association, American Cranberry Growers' Association, New Jersey Alfalfa Association, New Jersey Live Stock Breeders' Association, E. B. Voorhees Agricultural Society. The Interstate Fair is held annually at *Trenton*.

The Experiment Station Director reports that, since 1880, there has been a steady decrease in the area of tilled land in New Jersey, but a progressive increase in the value of agricultural products grown. Records show that the yields per acre are increasing and that farm practice in New Jersey is becoming more intensive. Less land is being farmed than formerly, but better methods are in vogue. General farming is becoming less prominent as time goes on. Specialized farming, on the other hand, is being emphasized. Potato production, the growing of apples, vegetables and cut flowers, and the production of market milk and eggs and poultry are occupying a constantly more important position. There has been a revival of interest in the production of meat animals, notably hogs and Milking Shorthorns. Striking progress has been made in some sections in the development of vegetable growing under overhead irrigation. Sections of central and southern New Jersey, in which farmers have become expert in the use of commercial fertilizers and green manures, have made notable progress. The potato growers of Monmouth, Mercer, Burlington, Cumberland and Salem Counties have been able to increase to a very marked extent the average yields per acre. Among the agricultural enterprises recently developed on a large scale may be mentioned the fruit orchards at Glassboro, Vineland and Bridgeton; the vegetable growing in the vicinity of Bridgeton, and the dairy development in the vicinity of Plainsboro, Wrightstown, Somerville, Montclair and elsewhere.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,537,167; *1,883,669*
White	2,445,894
Colored	89,760
Other non-white	1,513
(City, 1,907,210; country, 629,957)	
Number farmers	33,487; *34,650*
(White, 33,011; non-white, 476)	
Land area, acres	4,808,960
Acres in farms	2,573,857; *2,840,966*
Acres farm land improved	1,803,336; *1,977,042*
Average acres per farm	76.9 (53.9 acres improved)
Farms by size:	
50 to 99 acres	8,194
20 " 49 "	7,607
100 " 174 "	7,207
10 " 19 "	4,276
3 " 9 "	3,256
175 " 259 "	1,659
Value farm property	$254,832,665; *$189,533,660*
Per cent increase in 10 years	34.5
" value of farm property in land	48.7
" " " " " " buildings	36.5
" " " " " " stock and tools	14.7
Average value all property per farm	$7,610
Average value land per acre	$4[illegible].23; *$32.86*
Per cent of farms run by owners	72.1
" " " " " tenants	24.8
" " " " " managers	3.2

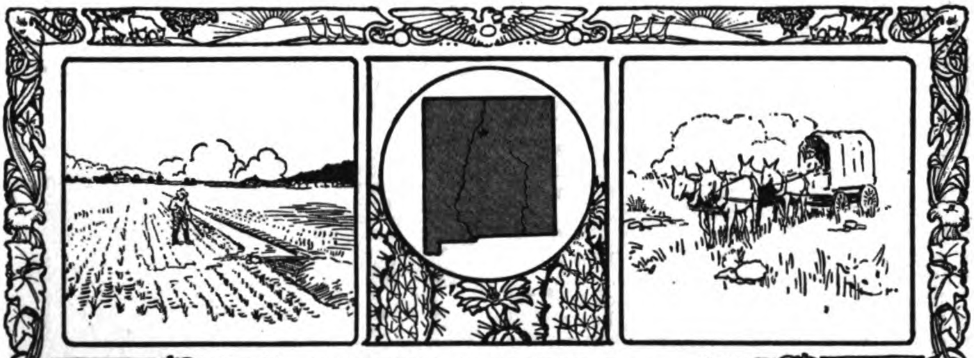
2. Crop Acreage, Yields, Values, 1910 and *[illegible]917*

Value all crops		$40,[illegible]0,491
Value all cereals		9,7[illegible]7,937
Corn, acres	265,441;	*2[illegible],000*
bushels	10,000,731;	*12,77[illegible]00*
value	$6,733,000;	*$21,711[illegible]0*
av. yield per acre (10 years), bushels		3[illegible]
Wheat, acres	83,637;	*89,0[illegible]*
bushels	1,489,233;	*1,691,00[illegible]*
value	$2,146,000;	*$3,602,000*
av. yield per acre (10 years), bushels		18.4
Oats, acres	72,130;	*73,000*
bushels	1,376,752;	*2,482,000*
value	$765,000;	*$1,737,000*
av. yield per acre (10 years), bushels		29.9

Rye, acres	69,032;	*69,000*
bushels	951,271;	*1,276,000*
value	$1,018,000;	*$2,233,000*
av. yield per acre (10 years), bushels		17.7
Buckwheat, acres	13,155;	*16,000*
bushels	212,548;	*288,000*
value		*$455,000*
Dry beans, acres	403;	*8,000*
bushels	2,941;	*80,000*
Value other grains and seeds		$75,991
Hay and forage, value		$7,627,402
acres		401,315
tons		569,442
Value vegetables		$14,073,467
Potatoes, acres	72,991;	*98,000*
bushels	8,057,424;	*11,172,000*
value		*$15,753,000*
Sweet potatoes and yams, acres	22,504;	*24,000*
bushels	3,186,499;	*2,880,000*
value		*$4,608,000*
Value other crops		4,696,248
Value fruits and nuts		4,069,446
Apples, trees	1,053,626; bushels,	1,406,778
		2,041,000
Peaches, nectarines, trees	1,216,476; "	441,440
		871,000
Pears, trees	731 616; "	463,290
		590,000
Plum, prunes, trees	46,547; "	9,594
Cherries, trees	102,124; "	44,636
Quinces, trees	14,777; bushels,	6,442
Grapes, vines	1,603,280; pounds,	6,501,221
Small fruits, acres	24,069; quarts,	38,822,987
Cranberries, acres	9,030; "	12,072,288
Nuts, trees	22,764; pounds,	249,626

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		30,941
Value of domestic animals		$22,325,469
Cattle, number	222,999; value,	$8,393,117
	229,000; "	*14,296,000*
Dairy cows, number	154,418;	
	155,000; "	*11,780,000*
Horses, number	88,922; "	12,012,512
	92,000; "	*13,708,000*
Mules, number	4,041; "	621,774
	4,000; "	*676,000*
Swine, number	147,005 "	1,127,040
	163,000; "	*2,771,000*
Sheep, number	30,683; "	161,138
	29,000; "	*209,000*
Poultry, number	2,597,448; "	2,221,610
Bees, colonies	10,484; "	41,560
Milk produced, gallons		67,698,219
Butter produced, pounds		3,622,411
Value dairy products		$10,156,600
Value poultry products		7,118,001
Value animals sold		3,433,924
Value animals slaughtered		1,562,926



NEW MEXICO

NEW MEXICO, one of the southwestern states, lies between 31 and 37 degrees north latitude, and 103 and 110 degrees west longitude. Area, 122,634 square miles, of which 131 are water.

Land surface. This is everywhere more than 3,000 feet above sea level, and the highest elevations (in the Rocky Mountains) reach 12,000 to 14,000 feet. Practically the entire western half of the state is mountainous, the Continental Divide, the Rockies and many lesser ranges traversing this region in all directions. The Rockies also occupy a good part of the northern half of the eastern part of the state, although they rapidly run into the Great Plains (3,000 to 3,500 feet above the sea) well inside the eastern border. The southeastern quarter is taken up by the level, arid Staked Plains which continue into Texas. In parts of the mountainous country, however, are extensive, elevated plateaus. The Rio Grande and Pecos Rivers flow entirely across the state from north to south, their valleys being narrow at the north but gradually widening to form broad stretches of arable land. The northeastern part is drained by the Canadian and Cimarron, the northwestern by the San Juan and Chuska Rivers tributary to the Colorado, the southwestern by the Gila and San Francisco.

Soils. These are mostly light and sandy on the elevated plains, some of them affording pasturage, and larger areas being devoted to dry-farming. In the river valleys generally, the soil is fertile and capable of producing abundant crops, but most of it needs irrigation, which is being supplied on considerable areas.

Climate. This is dry, moderately cool and healthful in much of the state. Temperatures vary according to latitude and altitude, but through the southern part, weather condi-

tions are said by the United States Weather Bureau to be more uniform than in any other part of the United States with a few exceptions. "Great extremes of temperature are uncommon, the air is dry and healthful under nearly all conditions, and the altitude is such as to give the best tonic effect to the human system." In the less elevated districts to the south, frosts are rare, and sunshine is abundant. Even in the hottest weather the nights are comfortable. In spring and early summer, high winds and dust storms occur, but destructive storms are rare, mostly in the form of occasional cloudbursts in the mountains. The average annual rainfall varies from 10 inches or less in the south to 20 inches in the north, and even 30 inches or more in the mountains. The frost-free season varies from about 270 days in the south to 160 to 170 days in the north.

Opportunities. Land under irrigation projects is available for settlement. Land offices are located at Santa Fe, Tucumcari, Las Cruces, Fort Sumner, Clayton and Las Vegas, from any of which definite information may be obtained. There are two extensive irrigation projects, besides smaller ones. One, known as the Elephant Butte Project and located in the Rio Grande Valley about 100 miles from the southern boundary, is one of the largest projects ever undertaken by the U. S. Reclamation Service, and furnishes water for an immense acreage in New Mexico, Texas and Mexico. The stored water forms the largest artificial lake in the world, extending back fully 40 miles. The Pecos Valley Project is not so large in extent, but stores sufficient water to irrigate considerable land.

Products and industries. Leading farm activities are the raising of cattle, horses and sheep, with hay and forage and corn on the irrigated areas. Other grains, especially drought-resistant types, are raised to some extent, and fruits are being increasingly grown, apples leading. A larger part of New Mexico's agricultural area is devoted to dry-farming than to irrigated farming. The area in the dry-farming districts is constantly increasing. Lumbering is carried on to some extent, as there are extensive forests of yellow pine, spruce and cedar in the mountains, and cottonwood, sycamore and oak in the river valleys. The wooded area is estimated at 22,000 square miles, and there are a dozen National forest reserves comprising about 11,000,000 acres. The leading mineral is coal, with some gold, silver, copper and zinc. Manufacturing is still in its infancy.

Transportation and markets. The leading railroad systems are the transcontinental lines, or follow the valleys of the larger rivers. The chief markets are principally the cities and mining towns in or near the state.

History. The Pueblo Indians and the cliff dwellers were the original inhabitants of New Mexico, and the earliest explorers were the Spaniards. In 1528, Narvaez started on a disastrous exploring expedition. Coronado made an expedition in 1540. Santa Fe, the earliest settlement, was founded early in the seventeenth century. The region became a province of Mexico in 1821, and a possession of the United States at the close of the Mexican war in 1848. Arizona Territory was organized in 1863, after which statehood was a subject of debate in Congress until 1910, when an act was passed admitting Arizona and New Mexico as separate states. Capital, Santa Fe; population, 1910, 5,072.

Agricultural organization. College of Agriculture and Mechanic Arts, and Experiment Station, *State College*. There is no State Board or Commissioner of Agriculture. The New Mexico Wool Growers' Association, and the New Mexico Cattle and Horse Growers' Association are statewide organizations that are doing much for the advancement of agriculture. The State Fair is held at *Albuquerque*, and a district fair under the same management at *Roswell*.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	327,301; *195,310*
White	304,594
Indian	20,573
Other non-white	2,134
(City, 46,571; country, 280,730)	
Number farmers	35,676; *12,311*
(White, 33,528; non-white, 2,148)	
Land area, acres	78,401,920
Acres in farms	11,270,021; *5,130,878*
Acres farm land improved	1,467,191; *326,873*
Average acres per farm	315.9 (41.1 acres improved)
Farms by size:	
100 to 174 acres	15,363
260 " 499 "	6,035
3 " 9 "	3,212
20 " 49 "	2,812
10 " 19 "	2,685
Value farm property	$159,447,990; *$53,767,824*
Per cent increase in 10 years	196.6
" value farm property in land	62.0
" " " " " buildings	8.2
" " " " " stock and tools	29.9
Average value all property per farm	$4,469
Average value land per acre	$8.77; *$3.38*
Per cent of farms run by owners	93.6
" " " " " tenants	5.5
" " " " " managers	0.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$8,922,397	
Value all cereals	2,382,996	
Corn, acres	85,999;	*170,000*
bushels	1,164,970;	*3,400,000*
value	$1,915,000;	*$6,392,000*
av. yield per acre (10 years), bushels	25.1	
Kafir corn and milo maize, acres	63,570;	*195,000*
bushels	543,350;	*3,510,000*
value		*$6,318,000*
Oats, acres	33,707;	*45,000*
bushels	720,560;	*1,350,000*
value	$634,000;	*$1,134,000*
av. yield per acre (10 years), bushels	34.6	
Wheat, acres	32,341;	*203,000*
bushels	499,799;	*2,582,000*
value	$1,175,000;	*$5,551,000*
av. yield per acre (10 years), bushels	22.1	
Barley, acres	2,131;	*13,000*
bushels	43,490;	*364,000*
value	$40,000;	*$506,000*
av. yield per acre (10 years), bushels	32.0	

Dry peas, acres	2,485;	bushels,	30,829
Dry beans, acres	20,766;	"	85,795
	213,000;	"	*958,000*
Value other grains and seeds			$319,275
Hay and forage value			4,469,709
acres			368,409
tons			431,053
Value vegetables			$820,497
Potatoes, acres	6,230;		*11,000*
bushels	295,255;		*1,276,000*
value			*$2,105,000*
Cotton, acres	790;	bales,	206
Broom corn, acres	4,470;	pounds,	644,892
Value other crops			$384,420
Value fruits and nuts			545,500
Apples, trees	542,528;	bushels,	417,143
			657,000
Peaches, nectarines, trees	136,191;	"	32,533
			60,000
Pears, trees	37,220;	"	29,435
			21,000
Plums, prunes, trees	51,257;	"	15,528
Cherries, trees	21,925;	"	6,384
Apricots, trees	8,202;	"	2,379
Grapes, vines	250,076;	pounds,	425,415
Small fruits, acres	66;	quarts,	76,532
Nuts, trees	503;	pounds,	1,498

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			31,104
Value of domestic animals			$43,191,913
Cattle, number	1,081,663;	value,	20,409,965
	1,230,000;	"	*51,236,000*
Dairy cows, number	51,451		
	85,000;	"	*5,780,000*
Horses, number	179,525;	"	7,868,314
	250,000;	"	*15,500,000*
Mules, number	14,937;	"	1,463,012
	19,000;	"	*1,691,000*
Asses and burros, number	11,852;	value,	$163,032
Swine, number	45,409;	"	275,851
	101,000;	"	*1,060,000*
Sheep, number	3,346,984;	"	12,072,037
	3,300,000;	"	*19,140,000*
Goats, number	412,050;	"	939,701
Poultry, number	531,625;	"	256,466
Bees, colonies	10,052;	"	46,300
Milk produced, gallons			6,815,942
Butter produced, pounds			1,477,617
Value dairy products			$726,692
Value poultry products			788,481
Value animals sold			10,099,489
Value animals slaughtered			842,396

4. Irrigation, 1909 and *1899*

Number farms irrigated	12,795
Per cent of all farms irrigated	35.9
Acreage irrigated	461,718
Types of project and acreages:	
U. S. Reclamation Service	13,398
U. S. Indian Service	24,007
Coöperative enterprises	251,911
Commercial enterprises	28,190
Individual and partnership enterprises	144,212

Per cent of crops grown under irrigation:
Corn, 40; oats, 54.1; wheat, 79.6; barley, 68.9; rye, 28; alfalfa, 96.4; timothy, 37.7; alfalfa seed, 52.8; dry beans, 13.2; potatoes, 18; dry peas, 62; small fruits, 63.6.

Yields	Irrigated	Non-irrigated
Corn, bushels	20.8	8.7
Oats, bushels	24.2	18.1
Wheat, bushels	17.7	6.6
Barley, bushels	24.1	12.2
Alfalfa, tons	2.65	.99
Potatoes, bushels	74.4	41.5

NEW YORK

NEW YORK ("Empire State"), one of the North Atlantic States, lies between 40 and 45 degrees north latitude, and 71 and 80 degrees west longitude. It is roughly three-cornered in shape, its extreme length, east and west, being 420 miles; its extreme breadth, 310 miles; and its area, 49,024 square miles, 1,570 of which are water.

Land surface. For the most part, the state consists of uplands with a gently rolling to rough and hilly surface, but the eastern part, for perhaps 50 miles back from the border, is largely mountainous. The ridges are part of the Appalachian system, and represent some of the oldest parts, and originally the highest lands, of the continent. At present, they range from 2,200 to 5,350 feet above sea level. The rest of the state forms, in the main, an elevated plateau, cut by rivers and, in the center of the state, by a group of long, narrow lakes, the Finger Lakes. To the north and west, this land slopes to Lake Ontario and the St. Lawrence River. To the south, it forms a gradual decline that crosses the border into Pennsylvania. The Mohawk River, draining a rich valley running through the center of

the state, runs into the Hudson which passes south almost along the eastern border, first between sloping banks, but lower down between steep, rocky cliffs. The Oswego River, running into Lake Ontario, drains the lakes of central New York, and the Genesee a large area in the west. Extending out from the southeast corner, is Long Island about 100 miles long and not over 15 miles wide. This consists of a hilly northern half, with elevations reaching 150 feet, and a smooth, prairie-like southern half sloping very gradually to the ocean. The state, therefore, exhibits a great variety of natural conditions in all respects.

Soils. These are largely of glacial origin. In the mountain region, they are very rocky, difficult of cultivation, generally productive, but better suited to dairying through the east and north, interspersed with general farming. In the central and western part, they are largely clay or limestone loams with very fertile alluvial soils in the valleys. Long Island is largely sandy, light along the southern border, heavier farther inland, but mostly susceptible of high cultivation. The extensive southern plateau of the western part of the state is of a stiff, poorly-drained character which needs a good deal of treatment before it can be made easily and profitably productive.

Climate. This varies widely according to altitude and nearness to the seashore in the east, and lakes in the west. The average annual temperature of western New York is about 46 degrees, being highest near Lake Ontario and lower farther south. The "Chautauqua Grape Belt," which extends for about 60 miles along the south shore of Lake Erie, is said to have the most temperate climate of any part of the state, except that along the Atlantic Coast. Highest and lowest recorded temperatures are 102 degrees, and 38 degrees below zero, the latter being unusual. The frost-free season averages about 140 days, being longest near the lakes. Average annual rainfall is about 45 inches, highest in the southern counties. In the central and eastern parts, the temperature averages somewhat lower, the frost-free season shorter, and the average rainfall less. On Long Island, zero temperatures and those above 100 degrees are very infrequent. The seasonal rainfall is ample, and the average frost-free season is 211 days.

Opportunities. While much of the land is held, and often farmed, at high valuations, there remain many acres of so-called "abandoned" farms which, carefully chosen and managed, can be made into profitable and comfortable homes. As generally found through the East, drainage and similar improvements are usually individual matters, though there are some drainage projects in the central and western parts of the state, which bring under cultivation considerable areas of rich alluvial soil. Information about farms for sale may be obtained from the Department of Agriculture, Albany. Increased raising of livestock offers a real New York opportunity.

Products and industries. New York, though largely farmed along general lines, is primarily a state of many special crops grown in definite localities. Thus we find medium-sized general hay and dairy farms all over it, in addition to several well-defined belts. Fruit is the main crop along the shores of Lakes Ontario and Erie, and over the hills lying back from the Hudson River. The Erie section is famed for its grapes as are also the shores of the lakes in the center of the state; peaches and apples are more important in the other two. Profitable orchards are found scattered through the center of the state, and especially around Rochester, which is also the center of an important nursery industry. Dairying is the main issue through the Mohawk Valley and in several northern and southeastern counties. South of the fruit belt in the west is an extensive bean-growing district. Numerous canneries in western New York stimulate the raising of many special vegetable crops on a large scale, and market gardening is highly developed around the larger cities, especially on the western half of Long Island, of which the eastern part is more given to the raising of potatoes, cabbage and cauliflower. Of the general crops, oats, hay, potatoes, buckwheat, corn (largely for silage) and rye are most important. The alfalfa acreage is steadily increasing. Dairy cattle are the most important livestock, there being many herds of excellent purebreds. Horses are raised to a considerable extent, but less than formerly, which is true also of sheep. Hogs and poultry are found on most farms, but are not restricted to particular belts or localities. Minerals are largely building stone, salt, iron ore. Fisheries are important, oysters being of greatest value. Main manufactures are clothing; machine-shop products; textile goods; sugar refining; malt liquors; flour and cereal products; tobacco products; chemicals; meat products; hosiery and knit goods; wood-working products; petroleum refining; paper and wood pulp; cheese, butter and condensed milk; boots and shoes. Leading manufacturing cities are New York, Buffalo, Rochester, Syracuse, Albany, Troy, Gloversville, Binghamton, Cohoes and Yonkers.

Transportation and markets. New York is well covered with railroads and many important electric lines. Water communication with the whole world is possible by way of canals, rivers, the lakes or the sea. The Barge Canal connects the Hudson River with Lake Erie at Buffalo. Via the Great Lakes, Canada and the west are reached. The Hudson River is navigable for large boats to Troy, 150 miles. New York is the leading market, the metropolis of the United States, and the

second largest city in the world. Other important markets are Buffalo, Rochester and Syracuse.

History. Though numerous explorers had previously visited the mouth of the Hudson, Henry Hudson "discovered" the river which bears his name in 1609, and established the Dutch claim to ownership. Just previous, Champlain had come down from the north, and discovered the lake afterward named for him. The Dutch established trading posts at Albany in 1614, on Manhattan Island in 1615, and on the Delaware River in 1623. In 1626, Governor Peter Minuit bought Manhattan Island from the Indians for goods valued at $24. Dutch rule ended and New Netherlands became New York in 1664. A Colonial Congress met in 1690, the Albany Convention in 1754, the Stamp Act Congress in New York 2 years later. In 1776, the British fleet took possession of New York. The state was the eleventh to join the Union. Congress met in New York City from 1785 to 1790 and here Washington was inaugurated, 1789. First convention for organization of state government met at White Plains, 1776, and first constitution adopted the following year.

Agricultural organization. State College of Agriculture and Experiment Station, *Ithaca;* State Experiment Station, *Geneva;* State Schools of Agriculture, *Farmingdale, Morrisville, Alfred, Canton, Cobleskill* and *Delhi.* Coöperative Demonstration Work, *Ithaca,* Department of Agriculture and Farmers' Institute Bureau, *Albany.* There are also a Dairymen's Association, Breeders' Association, Fruit Growers' Association; Western New York Fruit Growers' Association, Horticultural Society, Nurserymen's Association, Vegetable Growers' Association. The State Fair Commission holds an annual fair at *Syracuse.*

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	9,113,614; *7,268,894*
White	8,966,845
Colored	134,191
Other non-white	12,578
(City, 7,185,494; country, 1,928,120)	
Number farmers	215,597; *226,720*
(White, 214,658; non-white, 939)	
Land area, acres	30,498,560
Acres in farms	22,030,367; *22,648,109*
Acres farm land improved	14,844,039; *15,599,986*
Average acres per farm	102.8 (68.8 acres improved)
Farms by size:	
100 to 174 acres	61,031
50 " 99 "	56,821
20 " 49 "	31,047
175 " 259 "	21,901
3 " 9 "	17,231
10 " 19 "	15,533
260 " 499 "	9,262
Value farm property	$1,451,481,495; *$1,069,723,895*
Per cent increase in 10 years	35.7
" value of farm property in land	48.8
" " " " " " buildings	32.9
" " " " " " stock and tools	18.4
Average value all property per farm	$6,732
Average value land per acre	$32.13; *$24.34*
Per cent of farms run by owners	77.3
Per cent of farms run by tenants	20.8
" " " " " managers	1.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$209,168,236
Value all cereals			43,099,988
Oats, acres	1,302,508;		*1,275,000*
bushels	34,795,277;		*44,625,000*
value	$19,388,000;		*$33,469,000*
av. yield per acre (10 years), bushels			31.5
Corn, acres	512,442;		*840,000*
bushels	18,115,634;		*26,040,000*
value	$16,408,000;		*$51,559,000*
av. yield per acre (10 years), bushels			35.7
Wheat, acres	289,130;		*430,000*
bushels	6,664,121;		*8,385,000*
value	$10,102,000;		*$17,608,000*
av. yield per acre (10 years), bushels			20.4
Buckwheat, acres	286,276;		*330,000*
bushels	5,691,745;		*5,940,000*
value	$4,679,000;		*$9,504,000*
av. yield per acre (10 years), bushels			19.9
Rye, acres	130,540;		*135,000*
bushels	2,010,601;		*2,565,000*
value	$2,302,000;		*$4,720,000*
av. yield per acre (10 years), bushels			17.3
Barley, acres	79,956;		*110,000*
bushels	1,922,868;		*3,080,000*
value			*$4,004,000*
Value other grains and seeds			3,969,022
Hay and forage, value			77,360,645
acres			5,043,373
tons			7,055,429
Value vegetables			36,309,544
Dry beans, acres	115,698;	bushels,	1,681,506
	210,000;	"	*1,575,000*
Dry peas, acres	4,007;		71,486
Potatoes, acres	394,319;	"	48,597,701
	400,000;		*38,000,000*
Hops, acres	12,023;	pounds	8,677,138
Tobacco, acres	4,109;		*2,500*
pounds	5,345,035;		*3,125,000*
value			*$688,000*
Value other crops			23,528,546
Maple, trees			4,948,784
sugar made, pounds			3,160,300
sirup made, gallons			993,242
Value fruits and nuts			$24,900,491
Apples, trees	11,248,203;	bushels,	25,409,324
			14,059,000
Peaches and nectarines, trees	2,457,187;	"	1,736,483
			2,244,000
Pears, trees	2,141,596;	"	1,343,089
			1,708,000
Plums, prunes, trees	919,017;	"	553,522
Cherries, trees	673,989;	"	271,597
Quinces, trees	169,031;	"	132,451
Grapes, vines	31,802,097;	pounds,	253,006,361
Small fruits, acres	22,496;	quarts,	37,857,829
Nuts, trees	164,333;	pounds,	2,773,858

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			201,295
Value of domestic animals			$174,560,658
Cattle, number	2,423,003;	value,	$83,062,242
	2,478,000;	"	*130,683,000*
Dairy cows, number	1,509,594;		
	1,539,000;	"	*101,574,000*
Horses, number	591,008;	"	80,043,302
	609,000;	"	*84,651,000*
Mules, number	4,052;	"	650,497
	4,000;	"	*620,000*
Swine, number	666,179;	"	5,905,272
	759,000;	"	*11,157,000*
Sheep, number	930,300;	"	4,839,651
	840,000;	"	*7,056,000*
Goats, number	3,475;	"	21,432
Poultry, number	10,678,836;	"	7,879,388
Bees, colonies	156,360;	"	646,848
Milk produced, gallons			597,363,198
Butter produced, pounds			23,461,702
Value dairy products			$77,807,161
Value poultry products			23,634,440
Value animals sold			29,333,508
Value animals slaughtered			9,927,603

NORTH CAROLINA

NORTH CAROLINA ("Old North State"), one of the cotton states and a South Atlantic State, lies between 33 and 37 degrees north latitude, and 75 and 85 degrees west longitude. Its eastern and southeastern boundary is the Atlantic Ocean. Area, 52,425 square miles, of which 3,686 are water surface.

Land surface. The Coastal Plain rises gradually from sea level to an elevation of about 500 feet. Swamps and shallow lakes and lagoons are found along the coast. Next is the Piedmont Plateau, about 300 miles broad, gently rolling at first, becoming more uneven towards the mountains. Beyond this is the mountainous region containing the highest mountains east of the Mississippi, Mt. Mitchell, 6,710 feet, and more than 40 peaks of 6,000 feet or more. Its average elevation is about 4,000 feet. Numerous broad rivers including the Chonan, Roanoke, Pamlico, Neuse and Cape Fear, are navigable to the beginning of the Plateau where they become much narrower. On the west, are the Little Tennessee, Big Pigeon and French Broad Rivers, flowing into the Tennessee.

Soils. In the Coastal region, the upland soil is mostly a sandy loam underlaid with clay, and with much organic matter. Along the coast it is sandy and swampy. In the Piedmont region, is deep clay mixed with sand. In the mountain region, both valleys and slopes are fertile, and well adapted to all temperate climate products.

Climate. This varies from subtropical in the southeast to temperate in the northwest. The average annual temperature varies from 64 degrees in the southeast to 48 degrees in the northwest, the change being gradual. The frost-free season in the northwest averages about 180 days; in the southeast, about 200 days. The average annual rainfall varies from about 60 inches on the coast to about 54 inches in the northwest. Because of moisture-laden winds striking the south slope of the mountains, one station near the Georgia line reports an annual average of 82.6 inches, a greater amount than is received by any other station in the United States except on the North Pacific Coast. Snowfall is slight except in the mountains. The state lies mostly outside the great storm tracks, though tropical storms sometimes hit the coast.

Opportunities. Because of the wide variation in climate, elevation and soil, and the abundant rainfall, the state affords abundant opportunities for every branch of agriculture and horticulture. Some of these have been developed to a considerable extent while others are in their infancy. Information as to land and locations may be obtained from the Agricultural Experiment Station, or the Commissioner of Agriculture, both at Raleigh.

Products and industries. Leading farm activities are the production of corn, oats, cotton, peanuts, tobacco, hay, potatoes, sweet potatoes and yams, with sugar cane and rice in lesser amounts in the southern part. Livestock is not extensively raised, although dairying and swine production are increasing in importance in connection with the widespread campaign for more diversified agriculture. Lumbering is extensive, yet there are said to be still more than 30,000 square miles of untouched timber land. Fisheries are valuable, leading products being shad and oysters. In the mountain section, apples and grapes flourish, and on the eastern slopes, grapes and peaches. Cranberries grow wild, and all of the temperate-climate fruits do well. Trucking is carried on extensively along the coast, immense quantities of produce being shipped to northern cities to supply the early season demands. Great quantities of bulbs and flowers are grown for shipment to northern cities. North Carolina is the first among eastern states in the production of gold. Iron and copper are also found, but the state's most important mineral is mica, of which it is the chief source for the United States. Main manufactures in order of value of product are

cotton goods, tobacco products, lumber and timber products, cottonseed oil and cake, flour and grist-mill products, furniture and refrigerators, fertilizers, leather, hosiery and knit goods, carriages and railroad-shop products, foundry and machine-shop products, men's clothing, brick and tile. Chief manufacturing cities are Charlotte, Wilmington, Raleigh, Durham.

Transportation and markets. The railroad facilities over most of the state are excellent. Public roads, especially in the more level sections, are rapidly being extended and improved. In many parts of the state are excellent highways. Chief ports are Wilmington, Nebern, Washington and Elizabeth City.

History. The first exploring expedition was sent by Sir Walter Raleigh in 1584, and was followed by others in 1585 and 1587. These founded Roanoke where was born Virginia Dare, believed to be the first child born of English parents in America. In 1653, the first permanent settlement was made at Albemarle by a company of Virginia dissenters. The territory was divided into North Carolina and South Carolina about 1665. North Carolina was a leader in the American Revolution. Its state constitution was ratified in 1876, and in 1789 it ratified the United States Constitution. In 1791, Raleigh was made the capital. Before the Civil War, North Carolina opposed secession, but a secession ordinance was adopted, May 20, 1861. During the war, the state lost more soldiers than any other Confederate state. Capital, Charlotte; population, 1910, 34,014.

Agricultural organization. College of Agriculture and Mechanic Arts, *West Raleigh*, Experiment stations at both *Raleigh* and *West Raleigh*. A. & T. College for negroes, *Greensboro*. State Fair held at *Raleigh*. State Fair Association, Farmers' Union, Horticultural Association, United Fruit Growers of Western North Carolina, Good Roads Association.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,206,287;	*1,893,810*
White	1,500,511	
Colored	697,843	
Other non-white	7,933	
(City, 318,474; country, 1,887,813)		
Number farmers	253,725;	*224,637*
(White, 188,069; negro and other non-white, 65,656)		
Land area, acres	31,193,600	
Acres in farms	22,439,129;	*22,749,356*
Acres farm land improved	8,813,056;	*8,327,106*
Average acres per farm	88.4 (34.7 acres improved)	
Farms by size:		
20 to 49 acres	75,629	
50 " 99 "	62,157	
100 " 174 "	43,987	
10 " 19 "	28,240	
175 " 259 "	15,629	
3 " 9 "	14,868	
Value farm property	$537,716,210;	*$233,834,693*
Per cent increase in 10 years	130.0	
" value of farm property in land	63.8	
" " " " " " buildings	21.1	
" " " " " " stock and tools	15.1	
Average value all property per farm	$2,119	
Average value land per acre	$15.29;	*$6.24*
Per cent of farms run by owners	57.3	
" " " " " managers	0.4	
" " " " " tenants	42.3	

2. Crop Acreage, Yields, Values, 1910 and *1917*

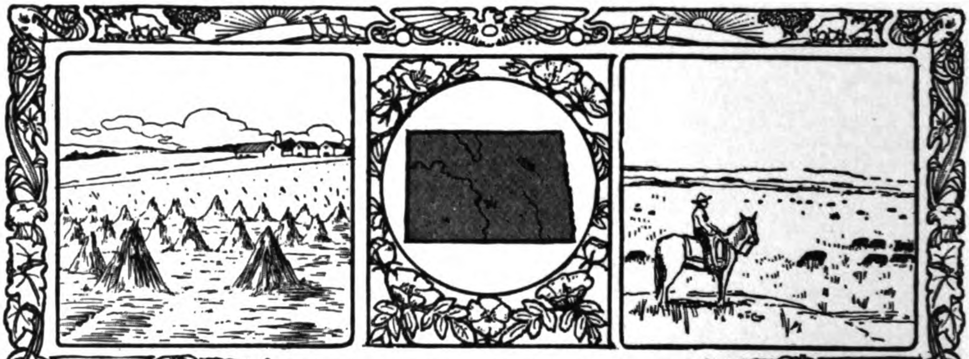
Value all crops		$142,890,192
Value all cereals		37,848,797
Corn, acres	2,459,457;	*3,000,000*
bushels	34,063,531;	*60,000,000*
value	$43,426,000;	*$102,000,000*
av. yield per acre (10 years), bushels		18.6
Wheat, acres	501,912;	*930,000*
bushels	3,827,145;	*9,765,000*
value	$8,176,000;	*$22,850,000*
av. yield per acre (10 years), bushels		10.5
Oats, acres	228,120;	*340,000*
bushels	2,782,508;	*5,780,000*
value	$2,075,000;	*$5,375,000*
av. yield per acre (10 years), bushels		17.9
Rye, acres	48,685;	*52,000*
bushels	280,431;	*520,000*
value	$152,000;	*$1,040,000*
av. yield per acre (10 years), bushels		10.0
Buckwheat, acres	11,606;	*12,000*
bushels	144,186;	*240,000*
value	$76,000;	*$312,000*
av. yield per acre (10 years), bushels		18.0
Rice, acres	521;	*300*
bushels	11,357;	*8,000*
value	$20,000;	*$16,000*
av. yield per acre (10 years), bushels		24.8
Dry peas, acres	169,934; bushels,	651,567
Dry beans, acres	5,521; "	35,937
Peanuts, acres	195,134;	*202,000*
bushels	5,980,919;	*7,676,000*
value		*$14,047,000*
Value other grains and seeds		$6,472,357
Hay and forage, value		$4,781,562
" acres		375,795
tons		369,332
Value vegetables		$12,585,018
Potatoes, acres	31,990;	*50,000*
bushels	2,372,260;	*4,500,000*
value		*6,435,000*
Sweet potatoes and yams, acres	84,740;	*90,000*
bushels	8,493,283;	*8,550,000*
value		*$8,978,000*
Tobacco, acres	221,890;	*325,000*
pounds	138,813,163;	*204,750,000*
value		*$64,496,000*
Cotton, acres	1,274,404;	*1,453,000*
bales	665,132;	*570,000*
value		*$78,945,000*
Sorghum cane, acres		21,227
tons		86,462
sirup made, gallons		1,099,346
Sugar cane, acres		294
tons		1,494
sirup made, gallons		21,677
Value other crops		$76,713,957
Value fruits and nuts		4,488,501

Apples, trees	4,910,171;	bushels,	4,755,693; *6,156,000*
Peaches, nectarines, trees	2,661,791;	"	1,344,410; *1,541,000*
Pears, trees	243,367;	"	84,019; *150,000*
Plums, prunes, trees	168,883;	"	61,406
Cherries, trees	168,065;	"	53,788
Quinces, trees	5,738;	"	1,125
Grapes, vines	411,278;	pounds,	15,116,920
Figs, trees	21,054;	"	660,624
Small fruits, acres	6,701;	quarts,	12,827,427
Pecan, trees	6,876;	"	74,861

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			240,103
Value of domestic animals			$60,050,731
Cattle, number	700,861;	value,	12,550,054
	679,000;	"	*19,347,000*
Dairy cows, number	308,914;		
	315,000;	"	*12,285,000*
Horses, number	166,151;	"	18,428,134
	185,000;	"	*$3,185,000*

	Number	Value
Mules, number	174,711;	value, $23,699,687
	200,000;	" *30,000,000*
Swine, number	1,227,625;	" 4,638,046
	1,550,000;	" *15,035,000*
Sheep, number	214,473;	" 559,217
	140,000;	" *546,000*
Goats, number	35,019;	" 43,039
Poultry, number	5,053,870;	value, $2,212,570
Bees, colonies	189,178;	" 386,683
Milk produced, gallons		82,601,779
Butter produced, pounds		26,059,585
Value dairy products		$5,789,583
Value poultry products		8,094,954
Value animals sold		7,209,306
Value animals slaughtered		11,317,680



NORTH DAKOTA

NORTH DAKOTA ("Flicker-Tail State"), one of the North Central States, lies between 45 and 49 degrees north latitude, and 96 and 105 degrees west longitude. The Red River of the North forms the eastern boundary. Area, 70,837 square miles, 654 of which are water.

Land surface. The state is in the Great Plains region, and is mostly rolling prairie. The Red River Valley is a broad, level plain at an elevation of about 1,000 feet above sea level extending down the eastern part. In the north are the Turtle Mountains, in the northeast the Pembina Mountains, in the southwest other scattered low elevations or sandstone buttes, and extending across the state from the northeast corner to the southern boundary east of the center, a plateau separating the Missouri River Valley from that of the Dakota. The Missouri River enters the state from Montana on the west, and flows east and south, leaving the state about midway of the southern border. Devil's Lake, northeast of the center, is salt and has no visible outlet. Many other small rivers flow into those named.

Soils. These are largely of a rich loam with clay subsoil. That of the Red River Valley is deep, very fertile and has long been noted as the finest of all hard-wheat belts. On the elevations, the soil is lighter; the rougher parts are best suited for grazing; but over most of the state, soil conditions are well adapted to general farming.

Climate. There are great extremes in temperature, but the dryness of the atmosphere here makes them entirely bearable and even very healthful. The average annual temperature for the eastern part is about 39 degrees, with extremes of 110 above and 53 below zero, and an average frost-free season of about 120 days; the average annual rainfall is about 19 inches. The western part has a slightly lower extreme winter temperature, an average frost-free season of about 115 days, and an average annual rainfall of about 17 inches. Snowfall is usually heavy.

Opportunities. With the development of irrigation projects, agricultural opportunities should increase. Information about land may be obtained from the Commissioner of Agriculture, Bismarck, or from the Agricultural Experiment Station, Fargo.

Products and industries. North Dakota's leading crops are wheat, oats, barley and flaxseed; in the production of the latter it leads the other states. The lack of moisture, dry, cold winters and heavy winds prevent extensive fruit growing, and vegetables are but little grown except for home or nearby consumption. Beef cattle, horses and swine are largely raised, and dairying is increasing in importance. It is predicted that apple growing will, in time, with the introduction of suitable varieties, become quite an industry in the southwestern part. Main minerals are lignite and natural gas. With the exception of milling, North Dakota is not much of a manufacturing state; the main manufactured products are flour, butter, cheese, condensed milk, and leathers.

Transportation and markets. The state is traversed from east to west by several leading railway systems. Principal east and west

railroad lines which, with their branches, afford excellent facilities, are the Northern Pacific; the Great Northern and the Minneapolis, St. Paul and Sault Ste. Marie. There are no large cities, and the markets, except for the grain crops and livestock, are mostly local.

History. First explorations were by French Canadians in 1780, and by the Lewis and Clark Expedition in 1804–5. This region was included in the Louisiana Purchase of 1803, and was that part of Louisiana Territory renamed Missouri Territory, 1812. In 1849, the portion east of the Missouri River was made part of Minnesota Territory, and that west of the river became part of Nebraska Territory. Dakota Territory, formed in 1861, included the Dakotas, most of Montana, and a large part of Wyoming. In 1863, the Dakotas were reduced to their present limits. In 1889, the territory was divided "on the line of the seventh standard parallel," and the two newly formed areas were admitted to statehood as North Dakota and South Dakota.

Agricultural organization. Agricultural College and Experiment Station, *Fargo;* Substations, *Dickinson, Edgeley, Hettinger, Landon* and *Williston.* School of Forestry, *Bottineau.* The Commissioner of Agriculture and Labor and the Dairy Commissioner are located at *Bismarck;* Food Commissioner and Farmers' Institute Board at *Fargo;* State Fair Associations at *Grand Forks, Fargo* and *Mandan;* Dairymen's Association at *Bismarck;* Live Stock Association at *Fargo.* Horticultural Association at *Hankinson.*

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	577,056;	*319,146*
White	569,855	
Indian	6,486	
Other non-white	715	
(City, 63,236; country, 513,820)		
Number farmers	74,360;	*45,332*
(White, 73,617; negro and other non-white, 743)		
Land area, acres		44,917,120
Acres in farms	28,426,650;	*15,542,640*
Acres farm land improved	20,455,092;	*9,644,520*
Average acres per farm	382.3 (275.1 acres improved)	
Farms by size:		
260 to 499 acres		29,048
100 " 174 "		23,003
500 " 999 "		12,662
175 " 259 "		5,345
1000 acres and over		2,416
50 to 99 acres		1,207
Value farm property	$974,814,205;	*$255,266,751*
Per cent increase in 10 years		281.9
" value farm property in land		74.9
" " " " " buildings		9.5
" " " " " stock and tools		15.6
Average value all property per farm		$13,109
Average value land per acre	$25.69;	*$11.15*
Per cent of farms run by owners		85.0
" " " " " tenants		14.3
" " " " " managers		0.7

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$180,635,520
Value all cereals		149,133,451
Wheat, acres	8,188,782;	*7,000,000*
bushels	116,781,886;	*56,000,000*
value	$32,494,000;	*$112,000,000*
av. yield per acre (10 years), bushels		11.2
Oats, acres	2,147,032;	*2,575,000*
bushels	65,886,702;	*38,625,000*
value	$4,217,000;	*$23,948,000*
av. yield per acre (10 years), bushels		26.7
Barley, acres	1,215,811;	*1,825,000*
bushels	26,365,758;	*22,812,000*
value	$2,985,000;	*22,812,000*
av. yield per acre (10 years), bushels		20.1
Corn, acres	185,122;	*590,000*
bushels	4,941,152;	*5,310,000*
value	$1,738,000;	*8,018,000*
av. yield per acre (10 years), bushels		23.8
Emmer and spelt, acres	101,144;	bushels, 2,564,732
Rye, acres	48,188;	*1,040,000*
bushels	689,233;	*9,880,000*
value	$454,000;	*$16,203,000*
Buckwheat, acres	1,039;	bushels, 17,066
Value other grains and seeds		$15,609,996
Hay and forage, value		12,368,014
acres		2,864,218
tons		3,010,401
Value vegetables		$3,148,304
Flaxseed, acres	1,068,049;	*965,000*
bushels	10,245,684;	*3,764,000*
value		*$11,292,000*
Dry beans, acres	544;	bushels, 5,073
Dry peas, acres	399;	" 5,543
Potatoes, acres	54,067;	*90,000*
bushels	5,551,430;	*3,870,000*
value		*$5,031,000*
Value fruits and nuts		49,343
Apples, trees	15,941;	bushels, 4,374
Peaches, nectarines, trees	90	" 35
Plums and prunes, trees	19,147	" 1,048
Cherries, trees	5,076;	" 209
Grapes, vines	379;	pounds, 360
Small fruits, acres	399;	quarts, 285,696
Value other crops		$326,412

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		71,634
Value of domestic animals		$106,761,317
Cattle, number	743,762;	value, $17,711,398
	1,039,000;	" *49,243,000*
Dairy cows, number	259,173	
	410,000;	" *25,215,000*
Horses, number	650,599;	" 83,461,739
	825,000;	" *87,450,000*
Mules, number	7,695;	" 1,149,001
	9,000;	" *1,098,000*
Swine, number	331,603;	" 3,152,909
	650,000;	" *8,450,000*
Sheep, number	293,371;	" 1,257,737
	250,000;	" *1,850,000*
Goats, number	1,074;	" 5,618
Poultry, number	3,268,109;	" 1,485,463
Bees, colonies	495;	" 3,086
Milk produced, gallons		70,637,899
Butter produced, pounds		16,414,439
Value dairy products		$4,872,304
Value poultry products		3,949,915
Value animals sold		11,409,158
Value animals slaughtered		3,047,590

4. Irrigation, 1909 and *1899*

Number farms irrigated	69
Per cent of all farms irrigated	0.1
Acreage irrigated	10,248
Types of project and acreages:	
U. S. Reclamation Service	1,610
Individual and partnership enterprises	8,638
Per cent of crops grown under irrigation:	
Oats, 47.2; alfalfa, 2.01; wheat, 22.1; wild grasses, 1.35	

OHIO

OHIO ("Buckeye State"), one of the North Central Corn Belt States, lies between 38 and 42 degrees north latitude and 80 and 85 degrees west longitude. The Ohio River forms the south and southeast boundaries, and Lake Erie two thirds of the northern boundary. Area, 41,040 square miles, 300 of which are water surface.

Land surface. A low-lying ridge crosses the State from northeast to southwest reaching its greatest height (1,540 feet) west of the center. From this the surface slopes toward Lake Erie on the north and the Ohio River on the south. The surface is hilly in the southeast, level in the west central part, and gently rolling over most of the rest of the state. The larger rivers are the Maumee, Sandusky, Vermilion, Black, Rocky, Cuyahoga, Grand and Ashtabula flowing into Lake Erie; the Little Beaver, Mahoning, Muskingum, Hocking, Scioto, Little Miami and Great Miami, flowing into the Ohio, and the St. Joseph flowing southwest across the northwest corner.

Soils. The eastern half of Ohio lies over sandstones and shales, except for limited areas in the coal measures. The western half lies over limestones. The underlying rocks have given the chief characteristics to the soils of the state, which have been modified by glacial action over all the state except the southeastern third. All are highly fertile and capable of intensive tillage. In the Ohio, Scioto and Miami Valleys, is much very fertile alluvial soil.

Climate. In the northeast, this is considerably modified by the effect of Lake Erie. The average annual temperature in the north is 49 degrees, with extremes of 105 degrees above and 32 degrees below zero. The average frost-free season ranges from 144 days in the interior to 195 days on the lake shore where the lowest recorded temperature is 16 degrees below zero. The average annual rainfall is 36.5 inches, lowest near the lake. In the southern and central parts, the average annual temperatures vary from about 50 degrees in the north to 55 degrees on the Ohio River, with extremes of 113 degrees above and 39 degrees below zero. The frost-free season averages about 164 days. The average annual rainfall is about 38 inches. The average annual snowfall varies from 15 to 54 inches at different stations throughout the State. Ohio lies in the track of the transcontinental storms from which some parts suffer occasionally. It is also subject to floods along some of its rivers.

Opportunities. There is no untaken public land suitable for agriculture.

Products and industries. Leading farm activities are the production of corn, oats, wheat, potatoes, hay and forage. Great quantities of fruits are grown, the leaders being apples, peaches, grapes and small fruits. The nursery business is of large proportions. Nearly all temperate-climate products are grown. All kinds of livestock are raised, both beef and dairy cattle, horses, sheep and swine, all being important. There are large numbers of high-class purebred flocks and herds. Considerable tobacco is grown in the west and southwest, and large quantities of vegetables wherever markets are easily reached. The state is a leader in beekeeping and honey production. Ohio was originally well covered with forests, largely hard wood, but these have been mostly cut. However, considerable timber is taken from the remaining forests and the second-growth trees. Leading minerals are soft coal, petroleum and natural gas. Ohio leads in clay products, brick, tile and pottery, and limestone is a valuable product. Main manufactures are iron and steel, the state ranking second in their production; foundry and machine-shop products; meat products; flour and cereal products, clothing, automobiles, lumber and timber products, boots and shoes, tobacco products, malt liquors, bakery prod-

ucts, carriages and wagons, pottery, furniture and refrigerators, agricultural implements, leather, butter, cheese and condensed milk. Ohio is thus one of the leading manufacturing states.

Transportation and markets. Transportation facilities are unexcelled. Most of the transcontinental railroads cross the state, which contains many important railroad centers. There are many electric railways. Lake Erie furnishes water transportation to all the Upper Lakes territory, Canada and the East; the Ohio and its tributaries to the Mississippi Valley and the Gulf.

History. The Ohio Company received a grant of land, 1749. In 1763, the territory was ceded by France to England, and the same year the British Parliament annexed the region to Quebec. Ohio Territory was organized in 1800; it was authorized by Congress in 1802 to draft a constitution, and in 1803 was declared a state. The capital was first at Chillicothe. It was removed to Zanesville in 1810, but has been at Columbus since 1816. Population Columbus, 1910, 181,511.

Agricultural organization. Board of Agriculture, Colleges of Agriculture and of Veterinary Medicine, *Columbus;* Agricultural Experiment Station, *Wooster*. State Fair held at *Columbus*. There is a State Grange, State Horticultural Society and numerous livestock associations. The Experiment Station Director reports that the trend of agriculture in Ohio is towards an extension of drainage, a more systematic rotation of crops, a larger production and more careful saving and use of manure, and a larger use of limestone and chemical fertilizers. The result is a slowly rising acre-yield of crops, and a marked increase in value of land.

Statistics

1. Farms and Farm Property, 1910 and *1900*

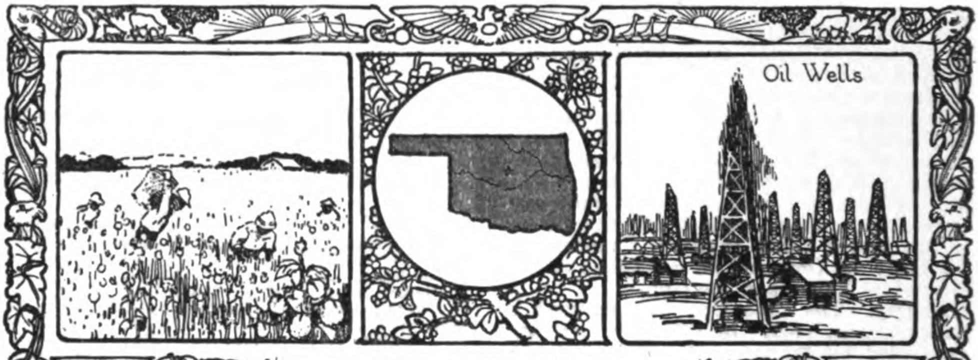
Population	4,767,121;	*4,157,545*
White	4,654,897	
Colored	111,452	
Other non-white	772	
(City, 2,665,143; country, 2,101,978)		
Number farmers	272,045;	*276,719*
(White, 270,095; non-white, 1,950)		
Land area, acres		26,073,600
Acres in farms	24,105,708;	*24,501,985*
Acres farm land improved	19,227,969;	*19,244,472*
Average acres per farm	88.6 (70.7 acres improved)	
Farms by size:		
50 to 99 acres		88,047
100 " 174 "		68,746
20 " 49 "		50,331
3 " 9 "		19,448
10 " 19 "		18,716
175 " 259 "		18,211
Value farm property	$1,902,694,589;	*$1,198,923,946*
Per cent increase in 10 years		58.7
" value of farm property in land		67.6
" " " " " " buildings		19.4
" " " " " " stock and tools		13.1
Average value all property per farm		$6,994
Average value land per acre	$53.34;	*$33.35*
Per cent of farms run by owners		70.6
" " " " " tenants		28.4
" " " " " managers		1.0

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$230,337,981
Value all cereals		137,907,934
Corn, acres	3,916,050;	*395,000*
bushels	157,513,300;	*150,100,000*
value	$66,488,000;	*$204,136,000*
av. yield per acre (10 years), bushels		38.0
Oats, acres	1,787,496;	*1,775,000*
bushels	57,591,046;	*78,100,000*
value	$22,980,000;	*$49,984,000*
av. yield per acre (10 years), bushels		32.5
Wheat, acres	1,827,932;	*1,870,000*
bushels	30,663,704;	*41,140,000*
value	$28,344,000;	*83,926,000*
av. yield per acre (10 years), bushels		15.9
Rye, acres	67,912;	*90,000*
bushels	921,919;	*1,620,000*
value	$665,000;	*$2,608,000*
av. yield per acre (10 years), bushels		16.4
Barley, acres	24,075;	*40,000*
bushels	569,279;	*1,320,000*
value	$530,000;	*$1,558,000*
av. yield per acre (10 years), bushels		27.6
Buckwheat, acres	26,073;	*25,000*
bushels	483,410;	*430,000*
value		*$658,000*
Value other grains and seeds		1,462,236
Hay and forage, value		42,357,364
acres		3,306,461
tons		4,521,409
Value vegetables		$20,875,927
Dry beans, acres	1,139; bushels,	13,665
	7,000; "	*35,000*
Potatoes, acres	212,808;	*160,000*
bushels	20,322,984;	*16,000,000*
value		*$22,880,000*
Value other crops		19,876,316
Tobacco, acres	106,477; pounds,	88,603,308
	103,200; "	*99,072,000*
Sugar beets, acres	7,036, tons,	63,696
Maple, trees		3,170,828
sugar made, pounds		257,592
sirup made, gallons		1,323,431
Value fruits and nuts		$7,858,204
Apples, trees	8,504,886; bushels,	4,663,752
		6,366,000
Peaches, nectarines, trees	3,133,368; "	1,036,340
		496,000
Pears, trees	899,019; "	374,871
		334,000
Plums, prunes, trees	1,001,734; "	215,657
Cherries, trees	1,144,271; "	338,644
Quinces, trees	245,040; "	81,101
Grapes, vines	8,326,800; pounds,	43,933,207
Small fruits, acres	11,591; quarts,	15,721,023
Nuts, trees	21,702; pounds,	559,093

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		260,265
Value of domestic animals		$187,523,324
Cattle, number	1,837,607; value,	$51,403,341
	1,813,000; "	*88,413,000*
Dairy cows, number	905,125;	
	950,000; "	*57,000,000*
Horses, number	910,224; "	98,910,638
	892,000; "	*106,148,000*
Mules, number	22,850; "	2,775,831
	26,000; "	*3,120,000*
Swine, number	3,105,627; "	19,412,730
	3,527,000; "	*43,029,000*
Sheep, number	3,909,162; "	14,941,381
	2,944,000; "	*21,197,000*
Goats, number	5,379; "	17,843
Poultry, number	17,342,289; "	9,532,672
Bees, colonies	98,242; "	275,726
Milk produced, gallons		307,590,755
Butter produced, pounds		63,569,132
Value dairy products		$30,869,408
Value poultry products		29,220,018
Value animals sold		74,632,856
Value animals slaughtered		14,964,130



OKLAHOMA

OKLAHOMA ("Boomer State"), a South Central State, lies between 33 and 37 degrees north latitude and 94 and 103 degrees west longitude. The Red River forms most of the southern boundary. Area, 70,057 square miles, 643 of which are water.

Land surface. This slopes to the south and east, the highest point being the Black Mesa (4500 feet) in the extreme northwest, from which the elevation gradually decreases to about 350 feet in the Red River Valley in the southeast. In the northeast, the extension of the Ozark Mountains forms a broad plateau with a general elevation of about 1,100 feet. In the southeast, the Ouachita Mountains rise to a height of 2,500 to 3,000 feet above sea level, and are generally wooded. East of these, the Arbuckle Mountains have peaks 1,400 feet above sea level. In the southwest, the Wichita Mountains have elevations of 1,000 to 1,200 feet above the surrounding plains. The central part is largely a rolling prairie. The principal rivers are the Arkansas, Canadian and Red, all belonging to the Mississippi system.

Soils. These are generally fertile, largely underlaid with a clay subsoil. The dark-colored soils are found at greater altitudes, with very compact subsoil; the lighter loams, at lower altitudes, are underlaid with a loose and mellow subsoil. Some of the higher soils contain much alkali. The longer streams are wide, shallow and sandy, but the shorter ones are narrow and have high, steep banks; the alluvial soil in the valleys is deep and rich. Previous to settlement by the whites, the prairies were burned over every year; the practice has left large areas of soils deficient in humus.

Climate. Hot summers and short, mild winters with a large proportion of sunny days are the rule. Average annual temperatures are 62 degrees in the southeast, about 58 degrees along the Kansas border and 55 degrees in the extreme northwest. The highest recorded temperature is 116 degrees, the lowest, 25 degrees below zero. High winds are common, the air is dry, and severe droughts sometimes occur. The average frost-free season is about 210 days in the east and about 200 days in the western part. The average annual rainfall varies from about 38 inches in the southeast to about 15 inches in the extreme northwest, but most of the rainfall is during the growing season. The snowfall is light, and lasts but a short time.

Opportunities. Some irrigation projects have been established. Information about these and other farming lands may be obtained from the Board of Agriculture, Oklahoma City, or from the Agricultural Experiment Station, Stillwater.

Products and industries. The agricultural products are greatly diversified, because the settlers from every state have developed the country in a very short space of time. The leading crops in order of their value are corn, cotton, wheat, hay and forage, oats, broom corn, Kafir corn and milo maize, and potatoes. Vegetables are largely grown but only for local consumption and markets. Fruit growing is not extensive, apples and peaches leading with a good many grapes and small fruits. Leading livestock are cattle, horses, mules and swine, with poultry making a good showing. The cattle industry is hampered by restrictions on cattle from Texas-fever districts, so more attention is given to the raising of good horses, mules and swine. Dairying is increasing. The wooded area is estimated at 24,000 square miles, largely hard woods, and this gives opportunity for extensive lumbering. Production of coal, petroleum and natural gas is extensive. The most extensive deposits of rock asphalt in the United States are found here. Manufacturing is in its infancy, but is bound to develop because of the great natural fuel resources, the abundance of raw materials, and the remoteness from other manufacturing states. Main manufactures

are flour and cereal products; cottonseed oil and cake; lumber and timber products; bakery products; foundry and machine-shop products; manufactured ice; butter, cheese and condensed milk; brick and tile.

Transportation and markets. Transportation facilities are excellent for a new state. A large part of the area is well covered by railroads. The Arkansas and Red Rivers are navigable for considerable distance for boats of light draft, which gives communication by water with the Mississippi and the Gulf.

History. Oklahoma was a part of the original Louisiana Purchase, except what was known for many years as the Public Land Strip, which was ceded by Texas to the United States in 1850, and added to Oklahoma in 1890. This country was early set aside as the "Indian Country," and was to remain unorganized. Between 1825 and 1850, the Indian tribes of the Five Nations were granted large tracts in the Indian Territory. Later large areas of these were ceded to the United States, and some of this land granted to other Indian tribes. In 1889, the vacant lands were thrown open to homeseekers. In 1893, the Cherokee Strip was opened. Other reservations were added in succeeding years. In 1890, Oklahoma Territory was set apart from Indian Territory. In 1905 a joint statehood bill was passed by Congress, and in 1907, Oklahoma was admitted to statehood. Capital, Oklahoma City; population 1910, 64,205.

Agricultural organization. Agricultural and Mechanical College and Experiment Station, *Stillwater;* Agricultural and Normal University, *Langston;* Coöperative Demonstration Work, *Yukon;* District Agricultural Schools, *Tishomingo, Broken Arrow, Warner, Helena, Lawton, Goodwell;* Board of Agriculture, *Oklahoma City;* Agricultural Association, *McAlester;* State Fair Association, *Oklahoma City;* New State Fair Association, *Muskogee;* Game and Fish Protective Association, *Oklahoma City.*

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,657,155	*790,391*
White	1,444,531	
Colored	137,612	
Indian	74,825	
Other non-white	187	
(City, 320,155; country, 1,337,000)		
Number farmers	190,192	*108,000*
(White, 169,521; negro and other non-white, 20,671)		
Land area, acres	44,424,960	
Acres in farms	28,859,353	*22,988,339*
Acres farm land improved	17,551,337	*8,574,187*
Average acres per farm	151.7 (92.3 acres improved)	
Farms by size:		
100 to 174 acres	75,186	
50 " 99 "	39,002	
20 " 49 "	31,489	
260 " 499 "	17,734	
175 " 259 "	16,078	
10 " 19 "	5,079	
Value farm property	$918,198,882	*$277,525,433*
Per cent increase in 10 years	230.9	
" value farm property in land	70.7	
" " " " " buildings	9.8	
" " " " " stock and tools	19.6	
Average value all property per farm	$4,828	
Average value land per acre	$22.49	*$6.50*
Per cent of farms run by owners	55.4	
" " " " " tenants	43.1	
" " " " " managers	1.5	

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$133,454,405	
Value all cereals	71,798,662	
Corn, acres	5,914,069	*3,900,000*
bushels	94,283,407	*33,150,000*
value	$47,100,000	*$48,730,000*
av. yield per acre (10 years), bushels	17.4	
Wheat, acres	1,169,420	*3,100,000*
bushels	14,008,334	*35,650,000*
value	$22,066,000	*$69,161,000*
av. yield per acre (10 years), bushels	12.1	
Oats, acres	609,373	*1,150,000*
bushels	16,606,154	*26,450,000*
value	$8,535,000	*$19,838,000*
av. yield per acre (10 years), bushels	22.5	
Kafir corn and milo maize, acres	532,515	*1,400,000*
bushels	4,658,752	*22,400,000*
value		*$31,360,000*
Barley, acres	10,283	*9,000*
bushels	127,641	*162,000*
value	$518,000	*$240,000*
av. yield per acre (10 years), bushels	19.8	
Emmer and spelt, acres	8,659; bushels, 94,580	
Rye, acres	4,291	*9,000*
bushels	37,240	*90,000*
value		*$153,000*
Value other grains and seeds	300,026	
Hay and forage, value	$9,638,648	
acres	1,347,598	
tons	1,417,533	
Value vegetables	$4,210,844	
Dry peas, acres	6,245; bushels, 33,282	
Potatoes, acres	32,295	*36,000*
bushels	1,897,486	*2,484,000*
value		*$4,471,000*
Sweet potatoes, yams, acres	5,056; bushels, 359,451	*15,000;* " *1,350,000*
Peanuts, acres	1,564	*17,000*
bushels	31,880	*544,000*
value		*$1,083,000*
Cotton, acres	1,976,935; bales, 555,742	*2,838,000;* " *890,000*
Broom corn, acres	216,350; pounds, 42,741,725	*175,000;* " *52,500,000*
Cane sorghum, acres	25,546; tons, 64,599	
sirup made, gallons	514,807	
Value fruits and nuts	$1,330,001	
Apples, trees	2,955,810; bushels, 742,182	*1,300,000*
Peaches, nectarines, trees	4,783,825; " 357,644	*1,150,000*
Pears, trees	207,271; " 7,450	*45,000*
Plums and prunes, trees	436,421; " 25,916	
Cherries, trees	295,042; " 2,372	
Grapes, vines	2,388,213; pounds, 3,762,727	
Small fruits, acres	2,745; quarts, 2,310,367	
Pecans, acres	96,766; pounds, 894,172	
Value other crops	$46,176,224	

3. Livestock, 1910 and *1917*

Farms reporting domestic animals	183,820	
Value of domestic animals	$148,652,983	
Cattle, number	1,953,560; value, 43,187,601	*1,757,000;* " *79,636,000*
Dairy cows, number	530,796	*535,000;* " *32,100,000*
Horses, number	742,959; " 63,651,661	*743,000;* " *63,898,000*
Mules, number	257,066; " 28,618,224	*276,000;* " *28,704,000*
Swine, number	1,839,030; " 11,997,641	*1,372,000;* " *13,994,000*
Sheep, number	62,472; " 253,864	*104,000;* " *655,000*
Goats, number	25,591; " 62,687	
Poultry, number	8,501,237; " 3,713,943	
Bees, colonies	19,413; " 64,261	

Milk produced, gallons	103,577,644
Butter produced, pounds	27,056,242
Value dairy products	$7,365,295
Value poultry products	10,850,097
Value animals sold	54,524,144
Value animals slaughtered	6,575,550

4. Irrigation, 1909 and ***1899***

Number farms irrigated	137
Per cent of all farms irrigated	0.1
Acreage irrigated	4,388
By coöperative enterprises	2,000
By individual and partnership enterprises	2,388

Per cent of crops grown under irrigation:
Wheat, 35.4; alfalfa, 50.5; wild grasses, 8.4.

Typical yields on irrigated land:

Corn, bushels	26.3
Oats, bushels	41.9
Wheat, bushels	26.3
Alfalfa, tons	1.35
Wild grasses, tons	1.20

OREGON

OREGON ("Beaver State"), one of the Pacific States, lies between 42 and 47 degrees north latitude, and 116 and 125 degrees west longitude. The Columbia River forms a large part of the northern boundary, and the Snake River about half of the eastern. Area, 96,699 square miles, 1,092 of which are water.

Land surface. Oregon is divided into eastern and western sections by the Cascade Mountains, which cross it from north to south about 120 miles back from the coast. These mountains range from 4,000 to 11,225 feet in height, the highest peak being Mt. Hood, near the northern border. The Coast Range, with an average elevation of 2,000 feet, with some peaks 3,500 feet or more in height, runs parallel with the coast and is met by projections from the Cascades, in the south. Between these two ranges, that is, in western Oregon, are the three important agricultural valleys—those of the Willamette, Umpqua and Rogue rivers. The narrow strip of land between the Coast Range and the Ocean consists of rolling hills, narrow valleys, tidal flats, sea beaches, high bluffs, rivers and mountain slopes where grass grows the year 'round. East of the Cascades, embracing about two thirds of the state, is a gently rolling tableland with a general elevation of 2,600 to 4,700 feet but cut by many deep cañons. The Blue Mountains in the north reach 7,000 feet. In this region are several fertile valleys. In the south is the Great Sandy Desert, where many small streams and lakes with no visible outlets are found.

Soils. In western Oregon, the Willamette and other coast valleys consist of alluvial deposits and silt, clay loams and sandy loams, the higher levels of red clay and sandy loams adapted more to natural grasses and grazing. In eastern Oregon, in the valley and plateau region of the Columbia, are great areas of fertile wheat land. In the Grande Ronde Valley are immense areas of fertile loam suitable for all crops. Farther south, much of the soil is volcanic or sandy with much alkali, but under irrigation produces good crops.

Climate. West of the Cascade Mountains the climate is much milder and moister than east of them. The average annual temperature of western Oregon ranges from 42 degrees on the mountains to 53 degrees in the valleys. Temperatures above 100 and below zero are rare. The frost-free season ranges from 303 days on the coast to 245 days in some of the lower valleys; on some of the higher mountains, of course, there is practically no frost-free period. The average annual rainfall for the year for this section, which falls mostly from October to May, varies from 20.2 inches in a protected valley to 133 inches at a station near the coast. In the eastern section, the average annual temperature is about 49.5 degrees, being highest in the lowlands along the Columbia River and lowest in the mountains. The frost-free season is more than 200 days in some favored localities, but in others frosts may occur during any month. The average annual rainfall varies from 8 inches at some of the lower ele-

vations to 50 to 60 inches on the mountains. The snowfall throughout the state also varies widely from the mild coast section, to the cold inland mountain heights.

Opportunities. In 1915, the unappropriated public land in Oregon comprised about 15,000,000 acres. The State Immigration Commission says: "Oregon offers opportunity for homemaking to those who bring the capital of strength, ambition and enough for fair investment. No comfort is offered idleness. No vision of fortune without work will be realized here." There are suitable lands and locations for those who wish to engage in any branch of agriculture, horticulture or livestock. Information may be obtained from the Oregon Development Bureau, Portland. Information about irrigated lands may be obtained from the U. S. Reclamation Service, Washington, D. C.

Products and industries. Leading farm activities are the production of wheat, oats, barley, hops and potatoes. Oregon produces nearly half the hops grown in the United States. Some of the finest flax in the world, equaled only by that of Ireland and Belgium, is also grown here. Apples are the leading fruit crop, those from the Hood River Valley being world famous; all the other tree fruits thrive, as do grapes and small fruits. Vegetables of all kinds grow to perfection. The most important livestock are sheep and Angora goats, horses, swine and cattle following in order. Poultry do well and the demand exceeds the production. Lumbering is a very important industry, more than half the state being heavily timbered. The state is among the foremost in fisheries, salmon being the most important, and the canning industry extensive. Oregon has a great variety of minerals, but none in very large quantities. The principal one is gold, and there is some coal, silver and copper. Manufacturing has not been extensively developed, though there are many natural advantages in the way of unlimited water power, transportation and raw materials. Leading manufactures are lumber products, flour and grist-mill products, meat products, canned fish, butter, cheese and condensed milk, paper and wood pulp.

Transportation and markets. West of the Cascade Range and along the Columbia River, railway lines are fairly numerous, but the great southeastern part is without railroads. The Pacific Ocean gives a great opportunity for foreign and coastwise trade. The Columbia River is navigable for large steamers to the Dalles, and to Portland by ocean steamers. The Columbia above the Dalles, and the Snake as far as the eastern boundary, are navigated by smaller craft. Oregon has a road-building policy that promises a unified system of permanent highways, and that has already resulted in road construction costing millions of dollars. Portland and Astoria are leading export markets.

History. First explorations were made along the coast by the Spaniards in 1543, and by Sir Francis Drake in 1579. In 1778, Captain Cook touched the coast at Nootka Sound and confirmed the English title to the Oregon territory. Fur traders visited the coast, and the Lewis and Clark Expedition reached the Columbia in 1805. First agricultural settlement in 1829. After 1840, immigration increased rapidly and trouble arose between American settlers and British traders which was finally settled in 1846, by a joint commission which made the forty-ninth parallel the boundary between the American and British possessions. Oregon was made a territory in 1848, and admitted to statehood in 1859. Capital, Salem; population, 1910, 14-094.

Agricultural organization. Agricultural College and Experiment Station, *Corvallis*, Branch stations, *Union*, *Hermeston*, *Noro*, *Talent*, *Burns*, *Astoria*. Fruit Growers' Association, State Board of Horticulture, *Portland*. There are, also, the Grange, Farmers' Educational Coöperative Union, Farmers' Fire Relief Association, Nurserymen's Association, Live Stock Sanitary Board, Board of State Fair Directors, Stallion Registration Board, Pure Seed Board.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	672,765	*413,536*
White	655,090	
Colored	1,492	
Indian	5,090	
Chinese	7,363	
Japanese	3,418	
Other non-white	312	
(City, 307,060; country, 365,705)		
Number farmers	45,502	*35,837*
(White, 44,875; negro and other non-white, 627)		
Land area, acres	61,188,480	
Acres in farms	11,685,110	*10,071,328*
Acres farm land improved	4,274,803	*3,328,308*
Average acres per farm, 256.8 ... (93.9 acres improved)		
Farms by size:		
100 to 174 acres	12,009	
20 " 49 "	6,888	
50 " 99 "	6,800	
260 " 499 "	5,663	
175 " 259 "	3,680	
Value farm property	$528,243,782	*$172,761,287*
Per cent increase in 10 years	205.8	
" value of farm property in land	77.9	
" " " " " " buildings	8.3	
" " " " " " stock and tools	13.8	
Average value all property per farm	$11,609	
Average value land per acre	$35.23	*$11.23*
Per cent of farms run by owners	83.1	
" " " " " tenants	15.1	
" " " " " managers	1.9	

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$49,040,725	
Value all cereals	17,860,136	
Wheat, acres	763,187	*821,000*
bushels	12,456,751	*12,811*
value	$9,297,000	*$23,316,000*
av. yield per acre (10 years), bushels	22.0	
Oats, acres	339,162	*365,000*
bushels	10,881,286	*9,125,000*
value	$4,897,000	*$6,844,000*
av. yield per acre (10 years), bushels	38.3	

Barley, acres	108,847;		*182,000*
bushels	2,377,735;		*5,278,000*
value	$1,250,000;		*$6,070,000*
av. yield per acre (10 years), bushels			34.4
Corn, acres	17,280;		*42,000*
bushels	451,757;		*1,260,000*
value	$367,000;		*$1,890,000*
av. yield per acre (10 years), bushels			29.8
Rye, acres	12,913;		*31,000*
bushels	147,024;		*356,000*
value	$226,000;		*$605,000*
av. yield per acre (10 years), bushels			17.0
Value other grains and seeds			$411,181
Hay and forage, value			15,225,957
acres			939,979
tons			1,587,796
Value vegetables			$4,548,523
Dry beans, acres	562;	bushels,	8,032
Dry peas, acres	436;	"	9,344
Potatoes, acres	44,265;	"	4,822,962
	75,000;	"	*8,100,000*
Sugar beets, acres	1,176;	tons,	15,606
Hops, acres	21,770;	pounds,	16,582,262
	10,000;	"	*5,000,000*
Value fruits and nuts			$4,093,399
Apples, trees	2,029,913;	bushels,	1,930,926
			3,500,000
Peaches and nectarines, trees	273,162;	"	179,030
			250,000
Pears, trees	273,542;	"	374,622
			600,000
Plums and prunes, trees	1,764,896;	"	1,747,587
Cherries, trees	223,456;	"	181,089
Apricots, trees	10,656;	"	4,616
Grapes, vines	381,302;	pounds,	3,206,874
Small fruits, acres	5,122;	quarts,	9,348,490
Walnuts, trees	9,526;	pounds,	79,060

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			42,209
Value of domestic animals			$58,243,921
Cattle, number	725,255;	value,	$17,570,685
	799,000;	"	*33,732,000*
Dairy cows, number	172,550;		
	222,000;	"	*12,210,000*
Horses, number	271,708;	value,	$25,181,143
	286,000;	"	*28,028,000*
Mules, number	9,927;	"	1,185,788
	10,000;	"	*1,030,000*
Swine, number	217,577;	"	1,570,949
	315,000;	"	*3,150,000*
Sheep, number	2,699,135;	"	12,213,942
	2,484,000;	"	*20,120,000*
Goats, number	185,411;	"	370,637
Poultry, number	1,823,680;	"	1,067,743
Bees, colonies	47,285;	"	150,164
Milk produced, gallons			56,106,599
Butter produced, pounds			5,667,964
Value dairy products			$6,067,024
Value poultry products			3,814,285
Value animals sold			14,972,615
Value animals slaughtered			2,461,159

4. Irrigation, 1909 and *1899*

Number farms irrigated	6,669
Per cent of all farms irrigated	14.7
Acreage irrigated	686,129
Types of projects and acreages:	
U. S. Reclamation Service	22,000
U. S. Indian Service	429
Carey Act enterprises	24,750
Irrigation Districts	1,500
Coöperative enterprises	149,985
Commercial enterprises	77,387
Individual and partnership enterprises	410,078

Per cent of crops grown under irrigation:
Corn, 4; oats, 6.0; wheat, 2.8; barley, 16.9; emmer and spelt, 5.7; timothy, 40.6; rye, 11.3; alfalfa, 83.6; alfalfa seed, 66.9; potatoes, 7.7; sugar beets, 49.5.

Yields	Irrigated	Non-irrigated
Oats, bushels	43.9	31.3
Wheat, bushels	27.1	16.0
Alfalfa, tons	3.29	2.22
Potatoes, bushels	121.4	107.9
Timothy, tons	1.96	1.84
Sugar beets, tons	8.50	17.94
Barley, bushels	30.7	20.0
Rye, bushels	12.1	11.3
Alfalfa seed	4.1	3.4

PENNSYLVANIA

PENNSYLVANIA ("Keystone State"), named after William Penn, the name meaning Penn's Woodland, is one of the North Atlantic States and lies between 39 and 43 degrees north latitude, and 74 and 81 degrees west longitude. Its extreme length east to west is 302 miles, its breadth, 158 miles. The Delaware River forms its entire eastern boundary. Area, 45,126 square miles, 296 of which are water.

Land surface. The State is crossed from the northeast corner to the southwest by the Appalachian Mountains which form a belt of parallel ranges and narrow valleys about 50 miles broad, making up, therefore, about a quarter of the state. The highest point in

the State is Blue Knob, 3,136 feet. The southeast corner is generally level, with elevations of from 75 to 500 feet at the base of the mountains where are found rounded hills and broad, fertile valleys. North and west of the mountain region occupying about half the state, is a broad plateau from 700 to 2,000 feet elevation with a rolling surface dotted with numerous low, flat-topped hills. The extreme eastern part drains into the Delaware River; the east-central part into the Susquehanna, which flows entirely across the State; and the western part into the Ohio, which is formed by the Allegheny from the north, rising in New York State, and the Monongahela from the south, rising in West Virginia. The extreme northwest corner drains into Lake Erie.

Soils. These are largely limestone or alluvial, the former prevailing in the valleys west of the Delaware Valley. In the south and southeast, the soils are extremely fertile, Lancaster County being recognized as one of the richest agricultural counties in the United States. These are adapted to general farming and trucking. The northern part is better adapted to dairying and fruit growing.

Climate. The western part is subject to greater extremes and lower winter temperatures than the eastern. The highest recorded temperature is 104 degrees above and the lowest, 30 degrees below zero. The frost-free season averages about 180 days and the average annual rainfall is about 42 inches, being heaviest in the southeastern part. The annual snowfall is about 44 inches. Disastrous floods sometimes occur in the river valleys. In the east, the winters are mild, zero temperatures being rare in the southeast. The climate is more humid, rendering the heat of summer more oppressive. In this section and also in the central Susquehanna Valley country, the extreme temperatures and the average annual temperatures, rainfall and snowfall are not far from those given above. To the southward and at the lower levels, the temperatures run higher and the frost-free season longer, as would naturally be expected.

Opportunities. While most of the cleared land of the state is under cultivation, farms in certain sections can be bought at a low price per acre. This is particularly true of farms located on soils of the so-called De Kalb series, some of which need liming and fertilizing. The Agricultural Experiment Station conducted lime and fertilizer experiments on the De Kalb soil in Centre County, the results indicating that such lands can be farmed profitably when properly treated with lime and commercial fertilizers. A list of farms for sale may be obtained from the State Department of Agriculture, Harrisburg.

Products and industries. No state has a greater variety of products. Leading farm activities are the production of corn, oats and wheat, hay and forage crops. Tobacco is grown extensively in Lancaster County. Immense quantities of vegetables are grown especially in the southeastern part. Apples, peaches and grapes are the leading fruits, the latter largely in the northwest. An important industry is the growing of garden seeds, Philadelphia being a center of the seed trade. Of livestock, dairy cattle are probably the most important, many full registered herds being found around Philadelphia, where also some excellent horses are raised. Farther out in the country, beef cattle are numerous. Grazing conditions are excellent for cattle and sheep. Lumbering is an important industry though much of the merchantable timber has been removed. Pennsylvania surpasses all other states in the value of mineral products. The leading ones are coal, both hard and soft, petroleum, natural gas, building stone and slate. Main manufactures are iron and steel, foundry and machine-shop products, leather, petroleum products, silk goods, flour and cereal products, and coke. Leading manufacturing cities are Pittsburgh, Philadelphia, and Bethlehem.

Transportation and markets. Only two states have a greater mileage, or more railways per square mile. Lake Erie gives water communication to all the Great Lakes region. The Ohio River furnishes a water outlet to the Mississippi and the Gulf of Mexico; and Delaware River and Bay provide for coast trade and foreign commerce. Philadelphia and Erie are ports of entry. The many canals in the state are less important than formerly. Leading market cities are Philadelphia and Pittsburgh, but all of the mining and manufacturing towns furnish excellent markets.

History. The shores of Delaware Bay were visited by different explorers from 1524 on. In 1638, the Swedes founded New Sweden on the Delaware River, but were conquered by the Dutch of New Netherland in 1655. In 1681, William Penn received a grant of the region forming the present state, and Philadelphia was laid out in 1682. In the same year Penn made a treaty with the Indians. Delaware was included with Penn's holdings, and there were many disputes over boundaries which were not finally settled till 1792. In 1774, Philadelphia was selected as the meeting place of the Continental Congress. The Declaration of Independence was signed at Philadelphia in 1776, and the State ratified the United States Constitution in 1787. In 1780 it provided for the gradual emancipation of its slaves. Capital, Harrisburg; population, 1910, 64,186.

Agricultural organization. College of Agriculture and Experiment Station, *State College*. State Board of Agriculture, *Harrisburg*. There are also a State Horticultural Society, Pennsylvania Breeders' and Dairymen's Association, Rural Progress Association, State Grange, Institute of Animal Nutrition, and

many county and local associations. There is no state fair, but an Interstate Fair is held annually at *Trenton, New Jersey.*

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	7,665,111; *6,302,115*
White	7,467,713
Colored	193,919
Other non-white	3,479
(City, 4,630,669; country, 3,034,442)	
Number farmers	219,295; *224,248*
(White, 218,749; non-white, 546)	
Land area, acres	28,692,480
Acres in farms	18,586,832; *19,371,015*
Acres farm land improved	12,673,519; *13,209,183*
Average acres per farm	84.8 (57.8 acres improved)
Farms by size:	
50 to 99 acres	65,687
100 " 174 "	55,518
20 " 49 "	39,721
3 " 9 "	19,130
10 " 19 "	18,556
175 " 259 "	14,096
Value farm property	$1,253,274,862; *$1,051,629,173*
Per cent increase in 10 years	19.2
" value of farm property in land	50.3
" " " " " " buildings	32.8
" " " " " " stock and tools	16.9
Average value all property per farm	$5,715
Average value land per acre	$33.92; *$29.70*
Per cent of farms run by owners	74.9
" " " " " tenants	23.3
" " " " " managers	1.8

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$166,739,898
Value all cereals		70,348,726
Corn, acres	1,380,671;	*1,575,000*
bushels	41,494,237;	*62,212,000*
value	$38,365,000;	*$95,184,000*
av. yield per acre (10 years), bushels		39.1
Oats, acres	1,144,248;	*1,175,000*
bushels	28,172,686;	*41,125,000*
value	$14,403,000;	*$30,021,000*
av. yield per acre (10 years), bushels		31
Wheat, acres	1,225,558;	*1,399,000*
bushels	21,564,479;	*24,482,000*
value	$25,481,000;	*$50,188,000*
av. yield per acre (10 years), bushels		17.6
Buckwheat, acres	292,728;	*350,000*
bushels	4,797,350;	*6,300,000*
value	$3,506,000;	*$10,269,000*
av. yield per acre (10 years), bushels		19.6
Rye, acres	272,560;	*260,000*
bushels	3,496,603;	*4,420,000*
value	$4,716,000;	*$7,514,000*
av. yield per acre (10 years), bushels		16.9
Value other grains and seeds		$185,539
Hay and forage, value		45,623,573
acres		3,088,105
tons		3,677,307
Value vegetables		$22,092,197
Dry beans, acres	1,269; bushels,	12,021
	13,000; "	*104,000*
Potatoes, acres	262,013; "	21,740,611
	321,000; "	*29,532,000*
Sweet potatoes and yams, acres	1,306; "	128,770
	1,000; "	*110,000*
Tobacco, acres	41,742; pounds,	46,164,800
	41,500; "	*58,100,000*
Value other crops		$17,695,691
Maple, trees		1,298,005
sugar made, pounds		1,188,049
sirup made, gallons		391,242
Value fruits and nuts		$10,794,172
Apples, trees	8,000,456, bushels,	11,048,430
		12,150,000
Peaches, nectarines, trees	2,383,027; "	1,023,570
		1,440,000
Pears, trees	796,882; "	378,825
		448,000
Plums, prunes, trees	744,148; "	295,158
Cherries, trees	1,075,031; "	475,093
Quinces, trees	176,849; "	62,350
Grapes, vines	5,271,264; pounds,	34,020,198
Small fruits, acres	8,678; quarts,	13,620,047
Nuts, trees	175,457; pounds,	3,795,804

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		207,384
Value of domestic animals		$133,327,286
Cattle, number	1,586,519; value,	$47,229,894
	1,644,000; "	*81,701,000*
Dairy cows, number	933,640;	
	980,000; "	*61,250*
Horses, number	549,756; "	68,055,489
	596,000; "	*75,096,000*
Mules, number	44,323; "	6,424,039
	48,000; "	*6,576,000*
Swine, number	977,637; "	7,624,494
	1,174,000; "	*16,319,000*
Sheep, number	883,074; "	3,934,144
	835,000; "	*5,928,000*
Goats, number	3,539; "	15,788
Poultry, number	12,728,341; "	7,674,387
Bees, colonies	124,815; "	478,179
Milk produced, gallons		336,208,572
Butter produced, pounds		61,158,115
Value dairy products		$42,808,802
Value poultry products		24,430,813
Value animals sold		29,592,251
Value animals slaughtered		15,712,856

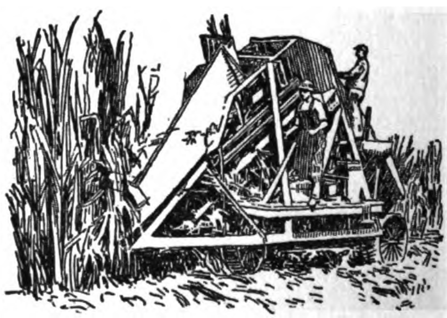
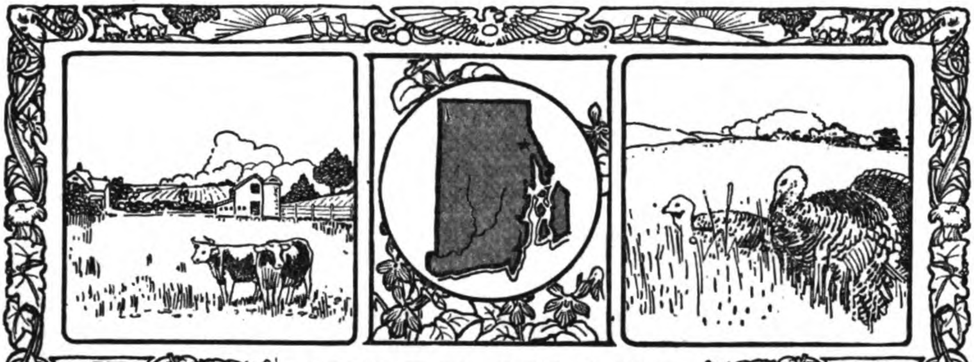


Fig. 374. A triumph of modern agricultural inventive genius—a tractor sugar-cane harvester



RHODE ISLAND

RHODE ISLAND ("Little Rhody"), one of the North Atlantic States, and one of the "original thirteen," lies between 41 and 43 degrees north latitude, and 71 and 72 degrees west longitude. Area, 1,248 square miles, 181 of which are water. It is the smallest and most thickly populated state in the Union.

Land surface. This is generally rough and hilly, being dotted with rough knolls. The elevation varies from sea level to 700 or 800 feet at points in the northwest, but in general is below 500 feet. The state is divided into 2 unequal portions by Narragansett Bay; in this are several islands which, with Block Island, 9 miles off the coast, belong to the State. There are a large number of small lakes or "ponds." The principal rivers are the Blackstone in the northeast, the Pawtuxet in the middle (these flowing into arms of the bay) and the Pawcatuck in the southwest flowing into the ocean.

Soils. These are of glacial origin, mostly coarse and gravelly, with many boulders and often difficult to cultivate, but they respond readily to fertilizers. In some parts are light loams and small areas of rich bottom land.

Climate. Being influenced by the ocean, this is generally equable, though the interior is subject to greater extremes. The highest recorded temperature is 102 degrees, the lowest 9 degrees below zero and the average annual temperature 49 degrees. The frost-free season averages about 190 days; the average annual rainfall is 49 inches, and the average annual snowfall about 36 inches. Severe coast storms sometimes sweep over the state.

Opportunities. There are some so-called "abandoned farms," which the State Experiment Station believes afford excellent opportunities for men who have some knowledge of the poultry business, who are in moderate circumstances, and who wish something that gives quick and steady returns. There are many places where the raising of fruits, especially apples, would pay.

Products and industries. Only a small part of the population is on farms, and the area of farm land has decreased greatly since early days. Leading farm crops are corn, oats, hay and potatoes. Near the cities, market gardening has been highly developed. In the eastern part, large quantities of onions are grown and early potatoes are a specialty on the Island section. Large areas of glass are used not only for producing winter vegetables and flowers, but also for starting plants for field culture. Apples are the leading tree fruit, closely followed by pears, while peaches succeed fairly well in some seasons. Many cranberries are grown, and there are some fine wild bogs. Strawberries are the leading small fruit. Market-milk production, hay growing and poultry (especially roaster and turkey) production are important in relation to the total agriculture of the state, but like all Rhode Island's farm activities, of small extent compared with those of other typical farming regions. Fisheries are extensive and valuable, oysters being of greatest value. Manufacturing is the main business, no other state approaching Rhode Island in value of manufactured products per capita. Main manufactures are textiles, worsted and cotton goods, foundry and machine-shop products, jewelry, electrical apparatus and supplies, hosiery and knit goods.

Transportation and markets. The New York, New Haven and Hartford Railroad with its branches reaches practically all parts of the state; there are, in addition, numerous electric lines, and from the eastern and southern parts, water communication to New York and Boston. Bristol, Providence and Newport are ports of entry. All the manufacturing towns are excellent markets.

History. Narragansett Bay was first explored in 1524. Roger Williams founded Providence in 1636, and in 1644 secured a patent of incorporation for the colony, defining the boundaries and granting the colonists "full power and authority to rule themselves." There was frequent dissension among

the different colonies, and much dispute over boundary lines, continued until 1862; but Rhode Island was always a refuge for the oppressed, and was the first to resist English oppression, renouncing its allegiance to the King in 1776. The first successful cotton factory was established at Pawtucket in 1793, and manufacturing soon became the leading industry of the state. Capital, Providence; population, 1910, 224,326.

Agricultural organization. Rhode Island State College and Agricultural Experiment Station, *Kingston.* There are the Rhode Island Horticultural Society, Rhode Island Fruit Growers' Association, Rhode Island Beekeepers' Association, Three States Fair Association, Producers' Coöperative Dairy Association, Rhode Island Poultry Association, Rhode Island Corn Growers' Association, Rhode Island Alfalfa Growers' Association, and several Farm Bureau Associations.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	542,610; *428,556*
White	532,492
Colored	9,529
Other non-white	589
(City, 524,654; country, 17,956)	
Number farmers	5,292; *5,498*
(White, 5,251; non-white, 41)	
Land, area, acres	682,880
Acres in farms	443,308; *455,602*
Acres farm land improved	178,344; *187,354*
Average acres per farm	83.8 (33.7 improved)
Farms by size:	
50 to 99 acres	1,264
20 " 49 "	1,144
100 " 174 "	945
10 " 19 "	647
3 " 9 "	585
175 " 259 "	312
Value farm property	$32,990,739; *$26,989,189*
Per cent increase in 10 years	22.2
" value farm property in land	45.5
" " " " " buildings	39.2
" " " " " stock and tools	15.3
Average value all property per farm	$6,234
Average value land per acre	$33.86; *$29.46*
Per cent of farms run by owners	77.2
" " " " " tenants	18.0
" " " " " managers	4.7

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$3,937,077
Value all cereals			376,097
Corn, acres	9,679;		*13,000*
bushels	398,193;		*546,000*
value	$365,000;		*$1,289,000*
av. yield per acre (10 years), bushels			38.6
Oats, acres	1,726;		*2,000*
bushels	48,212;		*62,000*
value	$34,000;		*$46,000*
Average yield per acre (10 years), bushels			29.2
Rye, acres	477;	bushels,	7,545
Barley, acres	182;	"	4,676
Buckwheat, acres	35;	"	550
Wheat, acres	13;	"	208
Value other grains and seeds			$4,814
Hay and forage, value			1,309,717
acres			61,327
tons			80,306
Value vegetables			$1,045,093
Dry beans, acres	54;	bushels,	817
Potatoes, acres	4,649;	"	552,677
	5,000;	"	*675,000*
Value fruits and nuts			$250,877
Apples, trees	152,009;	bushels,	212,908
			198,000
Peaches, nectarines, trees	39,342;	"	17,704
			20,000
Pears, trees	16,907;	"	12,501
			7,000
Plums, prunes, trees	4,836;	"	1,872
Cherries, trees	964;	"	214
Grapes, vines	7,662;	pounds,	152,937
Small fruits, acres	281;	quarts,	437,560
Nuts, trees	47;	pounds,	1,545
Value other crops			$950,479

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			4,676
Value of domestic animals			$2,902,316
Cattle, number	34,148;	value,	$1,309,088
	33,000;	"	*2,038,000*
Dairy cows, number	23,329		
	22,000;	"	*1,694,000*
Horses, number	9,547;	"	1,424,177
	8,000;	"	*1,240,000*
Mules, number	63;	"	11,155
Swine, number	14,038;	"	123,647
	14,000;	"	*203,000*
Sheep, number	6,789;	"	32,637
	5,000;	"	*36,000*
Goats, number	106;	"	982
Poultry, number	415,209;	"	368,018
Bees, colonies	1,267;	"	6,138
Milk produced, gallons			10,441,951
Butter produced, pounds			339,607
Value dairy products			$2,065,941
Value poultry products			1,245,508
Value animals sold			580,949
Value animals slaughtered			165,634

FIG. 375.—Shoot of the true huckleberry

SOUTH CAROLINA

SOUTH CAROLINA ("Palmetto State"), one of the South Atlantic States, lies between 32 and 36 degrees north latitude, and 78 and 84 degrees west longitude. The Savannah, Tugaloo and Chattooga Rivers separate it from Georgia. Area, 30,989 square miles, 494 of which are water.

Land surface. The State is mostly in the Coastal Plain and Piedmont Plateau regions in about equal parts, the division extending from northeast to southwest parallel with the coast. The Coastal Plain nowhere exceeds 450 feet above the sea, and is generally level with many swamps along the coast. Northwest of this is the hill country, the elevation gradually rising from about 500 feet to about 1,000 feet, with mountains ranging up to 3,548 feet in Sassafras Mountain on the North Carolina border. The rivers all flow toward the southwest, are rapid, and furnish abundant water power in the hill country. Principal ones are the Waccamaw, the Little and Great Pedee, the Black, the Congaree and Wateree forming the Santee, the Edisto and the Combahee. There are several islands along the coast.

Soils. Along the tidewater region are very fertile alluvial soils, some of them needing drainage and protection from overflow. From here to the hills the soils are lighter, sandy and clayey loams. In the hill country, gray sandy surface soils with red clay subsoils, or stiff red clay soils predominate; these are fertile and suited for general farming and fruit growing. The higher parts along the border are wooded and rocky.

Climate. This is equable and subtropical along the coast, and cooler and more subject to extremes toward the northwest boundary; the latter is much more healthful. The highest recorded temperature in the eastern part is 107 degrees, and the lowest, 9 degrees below zero, but zero temperatures are rare, and 100 degrees are not common on the coast. The humidity is high during summer. The average frost-free season is about 220 days, varying with the elevation. The average annual rainfall ranges from 43 inches on the lower levels to more than 55 inches in the northwest and is estimated at 60 inches on the North Carolina border. Snowfalls are frequent in winter, but light and of short duration. The State is in the track of the tropical storms that are sometimes destructive along the coast.

Opportunities. There are no untaken public lands nor extensive Government drainage or irrigation projects. A number of local cooperative drainage districts have been organized under a state law; in this way, districts in both the Piedmont Section and the Coastal Plain are being drained. In the Coastal Plain are large tracts of cut-over pine lands that may be purchased at reasonable prices. These lands are valuable for grazing, and when properly handled and cultivated, will grow abundant crops of corn, cotton, small grains, truck and tobacco. The counties bordering on the coast, especially around Beaufort and Charleston, have developed an enormous trucking business during the past few years. Large areas of undeveloped land afford excellent opportunities for progressive farmers. Information may be obtained from the Experiment Station at Clemson College.

Products and industries. Leading farm activities are the production of cotton, corn, vegetables and fruits for the northern markets, sweet potatoes and yams, and tobacco. Leading livestock are cattle, mules and swine. Dairying and poultrykeeping are increasing in importance. Lumbering is important, 19,000 square miles (most of it cut-over land) being available. Fisheries are considerable, oysters comprising about half the value. The chief mineral is phosphate rock. Manufactures are increasing rapidly, the main ones being cotton goods, in which the state ranks second, lumber and timber products, cottonseed oil and cake, and fertilizers.

Transportation and markets. The larger part of the state has railroad communication,

but these roads belong mostly to the main trunk lines. The larger rivers are navigable to some extent half way across the State. Beaufort, Charleston and Georgetown are ports of entry and have good harbors. Charleston is the leading export market, both for foreign and coastwise trade.

History. The Spaniards first visited what is now Port Royal in 1520. In 1562, a party of French Huguenots established a fort at the same place, and named the country Carolina for Charles IX. They abandoned the country the following year. Later the English claimed the territory because of the Cabots' explorations. The first English colony established on the Ashley in 1670; 10 years later it removed to the junction of the Ashley and Cooper Rivers and founded Charleston. Agriculture became the leading industry, the colonists prospered and slavery was apparently profitable. First negroes imported in 1671. The population increased rapidly to the time of the Revolution. South Carolina was represented at the Continental Congress, and was the first colony to adopt a Provincial Constitution, 1776. During the war of the Revolution, South Carolina contributed more money than any other state except Massachusetts, and more than 100 actions were fought within its borders. The Federal Constitution was adopted in 1788. South Carolina was a leader in the secession movement, the ordinance of secession being passed December 20, 1860. The Bombardment of Fort Sumter in Charleston Harbor April 12, 1861, opened the Civil War, and the evacuation of Charleston in February, 1865, was one of its closing events. The State was readmitted to the Union in 1868. On August 31, 1886, Charleston was visited by a destructive earthquake. Capital, Columbia; population, 1910, 26,319.

Agricultural organization. Clemson Agricultural College and Experiment Station, both *Clemson College*. Substations, *Florence* and *Summerville*. The Colored Normal, Industrial, Agricultural and Mechanical College of South Carolina, *Orangeburg*. State Agricultural and Mechanical Society, *Columbia*. South Carolina Live Stock Association; South Carolina Plant Breeders' Association. State Fair is held at *Columbia*.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,515,400; *1,340,316*
White	679,161
Colored	835,843
Other non-white	396
(City, 224,832; country, 1,290,568)	
Number farmers	176,434; *155,355*
(White, 79,636; negro and other non-white, 96,798)	
Land area, acres	19,516,800
Acres in farms	13,512,028; *13,985,014*
Acres farm land improved	6,097,999; *5,775,741*
Average acres per farm	76.6 (34.6 acres improved)
Farms by size:	
20 to 49 acres	70,582
50 " 99 "	33,147
Farms by size (*Continued*):	
10 to 19 acres	23,714
100 " 174 "	19,427
3 " 9 "	14,218
175 " 259 "	7,164
Value farm property	$392,128,314; *$153,591,159*
Per cent increase in 10 years	155.3
" value farm property in land	68.5
" " " " " buildings	16.4
" " " " " stock and tools	15.1
Average value all property per farm	$2,223
Average value land per acre	$19.89; *$7.14*
Per cent of farms run by owners	36.5
" " " " " tenants	63.0
" " " " " managers	0.5

2. Crop Acreages, Yields, Values, 1910 and *1917*

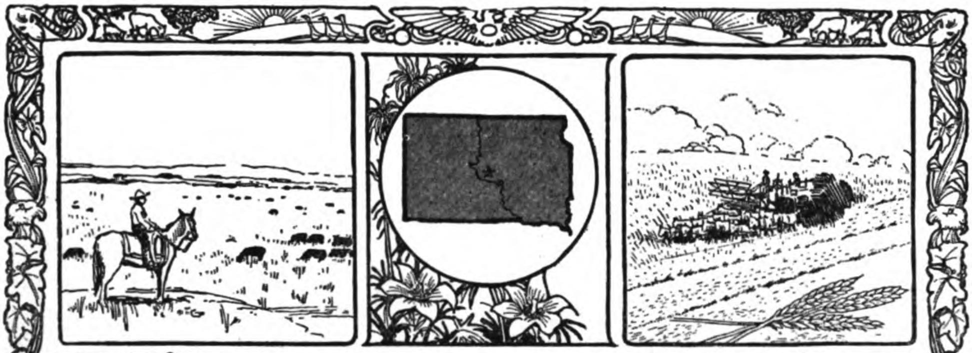
Value all crops			$141,983,354
Value all cereals			25,434,539
Corn, acres	1,565,832;		*2,313,000*
bushels	20,871,946;		*43,947,000*
value	$19,967,495;		*$84,378,000*
av. yield per acre (10 years), bushels			17.0
Oats, acres	324,180;		*400,000*
bushels	5,745,291;		*6,000,000*
value	$2,989,000;		*$6,000,000*
av. yield per acre (10 years), bushels			20.4
Wheat, acres	43,028;		*175,000*
bushels	310,614;		*1,838,000*
value	$428,647;		*$5,330,000*
av. yield per acre (10 years), bushels			10.4
Rice, acres	19,491;		*3,000*
bushels	541,570;		*75,000*
value			*$146,000*
av. yield per acre (10 years), bushels			22.9
Rye, acres	2,958;		*17,000*
bushels	20,631;		*170,000*
value	$58,000;		*$484,000*
av. yield per acre (10 years), bushels			10.1
Dry peas, acres	265,632;	bushels,	711,853
Dry beans, acres	1,528;	"	6,825
Peanuts, acres	7,596;	"	154,822
	10,000;	"	*450,000*
Value other grains and seeds			$1,469,088
Hay and forage, value			3,189,122
acres			209,767
tons			186,131
Value vegetables			6,922,021
Potatoes, acres	8,610;	bushels,	782,430
	15,000;	"	*1,440,000*
Sweet potatoes and yams, acres	48,878;	"	4,319,926
	80,000;	"	*7,600,000*
Tobacco, acres	30,082;	pounds,	25,583,049
	72,000;	"	*51,120,000*
Cotton, acres	2,556,467;	bales,	1,279,866
	2,876,000;	"	*1,235,000*
Cane, sugar, acres	7,053;	tons,	59,865
Cane, sugar, sirup made, gallons	881,558		
Cane, sorghum, acres	8,445;	"	27,612
Cane, sorghum, sirup made, gallons	262,452		
Value other crops			$103,733,668
Value fruits and nuts			$1,234,916
Apples, trees	581,767;	bushels,	362,800
			818,000
Peaches, nectarines, trees	1,336,142;	"	643,040
			1,130,000
Pears, trees	105,251;	"	65,680
			100,000
Plums, prunes, trees	82,212;	"	48,754
Cherries, trees	60,274;	"	10,987
Grapes, vines	79,708;	pounds,	2,016,506
Figs, trees	24,807;	"	975,136
Small fruits, acres	856;	quarts,	1,408,099
Pecan, trees	33,366;	pounds,	159,823

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			162,846
Value of domestic animals			$43,790,143
Cattle, number	389,882;	value,	$7,088,259
	404,000;	"	*11,494,000*
Dairy cows, number	180,842		
	189,000;	"	*7,560,000*

Horses, number	79,847;	value,	$10,147,178
	85,000;	"	*11,560,000*
Mules, number	155,471;	"	23,830,361
	174,000;	"	*$8,188,000*
Swine, number	665,211;	"	2,552,344
	920,000;	"	*8,740,000*
Sheep, number	37,559;	"	81,362
	30,000;	"	*96,000*

Goats, number	24,750;	value,	$27,728
Poultry, number	2,946,414;	"	1,206,615
Bees, colonies	75,422;	"	134,622
Milk produced, gallons			37,361,666
Butter produced, pounds			12,329,567
Value dairy products			$2,800,605
Value poultry products			4,177,611
Value animals sold			2,430,169
Value animals slaughtered			4,360,448



SOUTH DAKOTA

SOUTH DAKOTA ("Coyote State"), one of the North Central States, lies between 42 and 46 degrees north latitude, and 96 and 105 degrees west longitude. The Big Sioux and Missouri Rivers form part of the boundary on the southeast, and Lake Traverse and Big Stone Lake on the northeast. Area, 77,615 square miles, 747 of which are water.

Land surface. The Missouri River, crossing the state in a southerly direction, divides it into two parts. To the east, it is largely a gently rolling plain, treeless except along the streams, and diversified by a number of small lakes. The average elevation is about 1,500 feet above sea level. The James and Big Sioux Rivers flow south through this region into the Missouri River, their valleys being separated by higher divides. West of the Missouri, the surface is a rough, rolling table-land, and toward the western boundary is mountainous in the Black Hills region. The elevations range from about 1,500 feet at the Missouri River, to about 3,200 feet on the border of the Hills which are 6,000 to 8,000 feet high at some points. The hills are generally wooded, with fertile valleys and swiftly flowing streams which are fed by springs. The Missouri River drains this region, the chief tributaries on the west being the Grand, Moreau, or Owl, Cheyenne, Bad and White Rivers.

Soils. These are largely from a glacial till, in some places of great depth, and brown or yellow silt loams; in the southeastern part, loess is found forming brown silty loams of great fertility. In the river valleys, very fertile alluvial soils are found. West of the Missouri River, the soils are sandy loams, clay loams and heavy clays better suited for grazing than for tillage. In the Black Hills region, the narrow valleys are very fertile, and suited for general farming and fruit growing.

Climate. This is subject to sudden and extreme changes of temperature. The extreme dryness of the atmosphere makes the low temperatures seem less severe. Highest recorded temperature in the eastern part is 114 degrees; lowest, 46 degrees below zero. The average annual temperature is 44.5 degrees. The average frost-free season is about 130 days, longer in the south. The average annual rainfall is about 22 inches, the larger part during the growing season. The average annual snowfall is less than 30 inches. The state is subject to very high winds. In the western section, the highest recorded temperature is 115 degrees; the lowest, 44 degrees below zero. The average annual temperature is about 45.6 degrees. Average frost-free season about 130 days. Average annual snowfall about 38 inches. Average annual rainfall is about 17.3 inches, largely during the growing season. It is greatest in the more elevated Hills region, decreasing from south to north. Hailstorms sometimes occur. The Chinook winds sometimes modify the temperature in the northwest.

Opportunities. There are a number of irrigation projects, some conducted by the U. S. Reclamation Service, and others by coöperative and other enterprises. Information about the former may be obtained from the U. S.

Reclamation Service, Washington, D. C., and about other lands from the Board of Agriculture, Huron, or the Agricultural Experiment Station, Brookings.

Products and industries. South Dakota has developed rapidly in general agriculture, especially in the eastern section. Leading farm crops are wheat, corn in the southern part, oats, barley, emmer and spelt, flaxseed, potatoes and hay. General farming is the rule in the east. Fruit growing is not extensive, apples forming the larger part. Cattle and horses are the leading livestock, this being the great industry in the western section. Dairying is increasing in importance. Lumbering is confined to the Black Hills region. The leading mineral is gold, of which large quantities have been found in the Black Hills. Main manufactures are flour and other grist-mill products; butter, cheese and condensed milk; bakery products; lumber and timber products; all closely connected with agriculture.

Transportation and markets. East of the Missouri and in the southwest corner, railroads are numerous. Water transportation is afforded by the Missouri River and its branches.

History. South Dakota was a part of the Louisiana Purchase. It was visited by the Lewis and Clark expedition 1804–6. Fort Pierre was founded 1829. In 1838–9 General Fremont made extensive explorations in the eastern and central parts. Sioux Falls, the first industrial settlement, was founded in 1857. The part east of the Missouri River had been successively included in Michigan Territory in 1834; Wisconsin in 1836; Iowa in 1838; Minnesota in 1849; and the part west of the Missouri in Nebraska Territory in 1854. Dakota Territory was organized March 2, 1861. The Territorial Capital was located at Yankton in 1862, but was removed to Bismarck in 1883. The discovery of gold in 1874 hastened the development of the Black Hills regions. The territory was divided in 1889, and the same year, November 3, South Dakota was admitted as a state. Capital, Pierre, population, 1910, 3,656.

Agricultural organization. College of Agriculture and Mechanic Arts, Experiment Station, *Brookings*; sub-stations, *Eureka, Highmore, Cottonwood, Vivian.* Board of Agriculture, Huron. Corn Growers' Association, *Fulton.* Improved Live Stock and Poultry Association, Horticultural Society, Dairymen's Association, all *Brookings*; Live Stock Sanitary Board, *Pierre.* There are also a Game and Fish Commission and a State Grange.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	583,888; *401,570*
White	563,771
Indian	19,137
Other non-white	980
(City, 76,673; country, 507,215)	
Number farmers	77,644; *52,622*
(White, 74,836; negro and other non-white, 2,808)	
Land area, acres	49,195,520
Acres in farms	26,016,892; *19,070,616*
Acres farm land improved	15,827,208; *11,285,983*
Average acres per farm	335.1 (203.8 acres improved)
Farms by size:	
100 to 174 acres	28,396
260 " 499 "	24,811
500 " 999 "	9,698
175 " 259 "	8,230
50 " 99 "	2,406
1,000 acres and over	2,174
Value farm property	$1,166,096,980; *$297,525,302*
Per cent increase in 10 years	291.9
" value of farm property in land	77.4
" " " " " " buildings	8.8
" " " " " " stock and tools	13.8
Average value all property per farm	$15,018
Average value land per acre	$34.69; *$9.92*
Per cent of farms run by owners	74.7
" " " " " tenants	24.8
" " " " " managers	0.6

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops		$125,507,249
Value all cereals		98,953,050
Wheat, acres	3,217,255;	*3,716,000*
bushels	47,059,590;	*52,024,000*
value	$41,581,000;	*$101,967,000*
av. yield per acre (10 years), bushels		11.1
Corn, acres	2,037,658;	*3,350,000*
bushels	55,558,737;	*97,150,000*
value	$21,620,000;	*$116,580,000*
av. yield per acre (10 years), bushels		27.4
Oats, acres	1,558,643;	*1,925,000*
bushels	43,565,676;	*65,450,000*
value	$10,522,000;	*$39,924,000*
av. yield per acre (10 years), bushels		26.8
Barley, acres	1,114,531;	*1,020,000*
bushels	22,396,130;	*26,520,000*
value	$10,633,000;	*$29,172,000*
av. yield per acre (10 years), bushels		21.4
Emmer and spelt, acres	259,611;	bushels, 6,098,982
Flaxseed, acres	518,566;	*140,000*
bushels	4,759,794;	*980,000*
value		*$2,950,000*
Potatoes, acres	50,052;	*80,000*
bushels	3,441,692;	*7,200,000*
value		*$7,992,000*
Rye, acres	13,778;	*350,000*
bushels	194,672;	*5,600,000*
value		*$8,680,000*
Dry peas, acres	1,783;	bushels, 10,598
Buckwheat, acres	1,904;	" 28,551
Dry beans, acres	809;	" 5,285
Value other grains and seeds		$7,646,184
Hay and forage, value		$15,243,664
acres		3,435,656
tons		3,651,024
Value other crops		$399,875
Value vegetables		3,001,574
Value fruits and nuts		262,902
Apples, trees	274,862; bushels,	191,784; *349,000*
Peaches, nectarines, trees	1,815; "	148
Plums and prunes, trees	268,268; "	31,748
Cherries, trees	51,613; "	5,924
Pecans, trees	1,844; pounds,	162
Grapes, vines	38,647; pounds,	144,634
Small fruits, acres	419; quarts,	401,295
Nuts, trees	18,490; pounds,	73,715

3. Livestock, 1910 and *1917*

Farms reporting domestic animals		72,065
Value of domestic animals		$124,841,010
Cattle, number	1,535,276; *1,705,000;*	value, $36,257,234; " *86,718,000*
Dairy cows, number	369,764; *524,000;*	" *35,108,000*
Horses, number	669,362; *774,000;*	" 73,442,978; " *71,982,000*
Mules, number	12,424; *15,000;*	" 1,668,617; " *1,620,000*

Swine, number	1,009,721;	value, $10,387,093
	1,432,000;	" *22,196,000*
Sheep, number	611,264;	" 3,002,038
	658,000;	" *4,869,000*
Goats, number	2,337;	" 11,422
Poultry, number	5,251,348;	" 2,356,465
Bees, colonies	6,565;	" 31,650
Milk produced, gallons		82,428,514
Butter produced, pounds		13,629,647
Value dairy products		$6,192,608
Value poultry products		5,871,770
Value animals sold		35,722,056
Value animals slaughtered		2,637,084

4. Irrigation, 1909 and *1899*

Number farms irrigated	500
Per cent of all farms irrigated	0.6
Acreage irrigated	63,248
Types of project and acreages:	
U. S. Reclamation Service	5,613
U. S. Indian Service	50
Coöperative enterprises	13,601
Commercial enterprises	6,300
Individual and partnership enterprises	37,684

Per cent of crops grown under irrigation:
Wild grasses, 46.5; alfalfa, 15.1; alfalfa seed, 5.4.

Typical yields on irrigated land:	
Corn, bushels	21.8
Oats, bushels	36.0
Wheat, bushels	19.3
Barley, bushels	19.2
Alfalfa, tons	2.85
Alfalfa seed, bushels	2.1
Potatoes, bushels	81.2

TENNESSEE

TENNESSEE ("Big Bend State"), one of the South Central States, lies between 35 and 37 degrees north latitude, and 81 and 91 degrees west longitude. The Mississippi River forms the entire western boundary. Area, 42,022 square miles, 335 of which are water.

Land surface. This is greatly diversified. The Great Smoky Mountains extend northeast to southwest across the eastern part, with an average elevation of 5,000 feet and some peaks of 6,000 feet. Next is the Valley of East Tennessee extending across the State parallel with the mountains at an average elevation of 1,000 feet and comprising 9,000 square miles. Next comes the Cumberland Tableland or Plateau, about 2,000 feet high and 50 miles wide with a surface area of about 5,000 square miles. The Central Basin is lower, with an average elevation of about 500 feet. Surrounding the Basin is the Highland Rim with an elevation of about 1,000 feet; next comes the western valley of the Tennessee, about 370 feet and the plateau of West Tennessee rising to about 700 feet and then sloping to the Mississippi and ending in a line of bluffs about 350 feet above sea level. The Tennessee River, formed by a union of the Holston and Clinch in the eastern part, flows south into Alabama and reenters Tennessee in the western part, and flows north entirely across the state into Kentucky. The Cumberland enters the State from Kentucky, makes a detour through the northern part and returns to Kentucky. Both flow into the Ohio. Numerous small rivers flow into these and into the Mississippi on the west.

Soils. These are as varied as the surface, but are mostly fertile. In the mountain region the soil of the valleys is fertile, the mountains are forested and grass grows along their summits. In the Tennessee River Valleys fertile loams predominate. Thin loams predominate on the Cumberland Plateau. On the Highland Rim are fertile red soils, the gray soils being poor as a rule. The Central Basin has fertile loams with bluegrass lands and phosphate deposits and is the richest agricultural region. The western slope has silt soils adapted to a wide range of crops, and the Mississippi River bottoms the richest almost inexhaustible alluvial soils.

Climate. This is considered very healthful, sudden and extreme changes of temperatures being rare. The average annual temperature for the state is 58 degrees, higher in the valleys, lower in the mountains. The highest recorded temperature is 107 degrees;

the lowest, 30 degrees below zero, but these extremes are rare. Average frost-free season is about 180 days, varying according to elevation. The average annual rainfall is about 50 inches. The average annual snowfall is about 10 inches. Tennessee lies outside the principal storm tracks so is not subject to severe storms.

Opportunities. There are large areas of undeveloped lands especially on the Highland Rim and the Cumberland Plateau. The State laws are favorable to drainage projects as approved by the county courts. In this way large areas are being reclaimed in West Tennessee. Information about lands for settlers may be obtained from the State Department of Agriculture, Nashville.

Products and industries. The diversified surface, the different elevations, the great variety of soil, the abundant rainfall and favorable climate insure a wide range of agricultural products. The leading farm crops are corn, wheat, oats, cowpeas, soy beans, peanuts, hay, cotton, tobacco and potatoes. Large quantities of vegetables are grown for market. Most small fruits are indigenous to the State. Apples and peaches are the leading tree fruits, and grapes thrive in all locations. The leading livestock are horses, mules, cattle and hogs. Dairying is an important and growing industry, while poultry exceeds in value the sheep. Lumbering is one of the most important industries, forests of hard wood being extensive. The fisheries are not extensive. Coal is the leading mineral; copper, iron ore, phosphate, marble and zinc are important. Main manufactures are lumber and timber products, flour and grist-mill products, foundry and machine-shop products, railroad shop construction, cottonseed oil and cake, cotton goods, iron and steel, hosiery and knit goods.

Transportation and markets. Transportation facilities are good, Memphis being a railroad center, and a number of trunk lines crossing the state. The Mississippi, Tennessee and Cumberland Rivers furnish abundant water communication. The larger market cities are Memphis, Nashville, Chattanooga and Knoxville.

History. De Soto reached the present site of Memphis in April, 1541. French explorers descended the Mississippi River in 1673, erected Fort Prud'Homme in 1682, and a trading post near Nashville in 1714. The English established Fort London in 1756. A series of permanent settlements were begun in 1769 on the Wautauga and Holston Rivers by colonists from Virginia and North Carolina. Tennessee was made a part of North Carolina and was known as the County of Washington. It was ceded by North Carolina to the Federal Government in 1784, receded in 1790. The first Territorial legislature met in 1794, a constitutional convention was held in 1796, and on June 1 of that year Tennessee became a state. A secession ordinance was adopted by popular vote, June, 1861. Next to Virginia, Tennessee was the principal battle ground of the Civil War. It was readmitted to the Union, July 24, 1866. Capital, Nashville; population, 1910, 110,364.

Agricultural organization. College of Agriculture and Experiment Station, *Knoxville;* West Tennessee sub-station, *Jackson;* Middle Tennessee sub-station, *Columbia.* Cooperative Demonstration Work, Eastern Tennessee, *Washington, D. C.;* Western Tennessee, *Birmingham, Alabama.* State Fair Board, *Nashville;* Tri-State Fair Board, *Memphis.* Nashville, Knoxville and Memphis each has a division fair partly supported by the state. State Department of Agriculture, *Nashville.* There are Farmers' Institute Boards for the middle, eastern and western sections; Farmers' Union, Nurserymen's Association, and Highway Association.

The Experiment Station Director reports that agricultural conditions are improving; that better methods of farming are followed than formerly; that purebred livestock is on the increase; and that there appears to be no reason why Tennessee should not become a prominent livestock state.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	2,184,789;	*2,020,616*
White	1,711,432	
Negro	473,088	
Other non-white	269	
(City, 441,045; country, 1,743,744)		
Number farmers	246,012;	*224,623*
(White, 207,704; negro and other non-white, 38,308)		
Land area, acres		26,679,680
Acres in farms	20,041,657;	*20,342,058*
Acres farm land improved	10,890,484;	*10,245,950*
Average acres per farm	81.5 (44.3 acres improved)	
Farms by size:		
20 to 49 acres		72,212
50 " 99 "		60,105
100 " 174 "		41,545
10 " 19 "		32,485
3 " 9 "		14,713
175 " 259 "		14,149
Value farm property	$612,520,836;	*$341,202,025*
Per cent increase in 10 years		79.5
" value of farm property in land		60.6
" " " " " " buildings		17.8
" " " " " " stock and tools		21.6
Average value all property per farm		$2,490
Average value land per acre	$18.53;	*$9.93*
Per cent of farms run by owners		58.6
" " " " " tenants		41.1
" " " " " managers		0.3

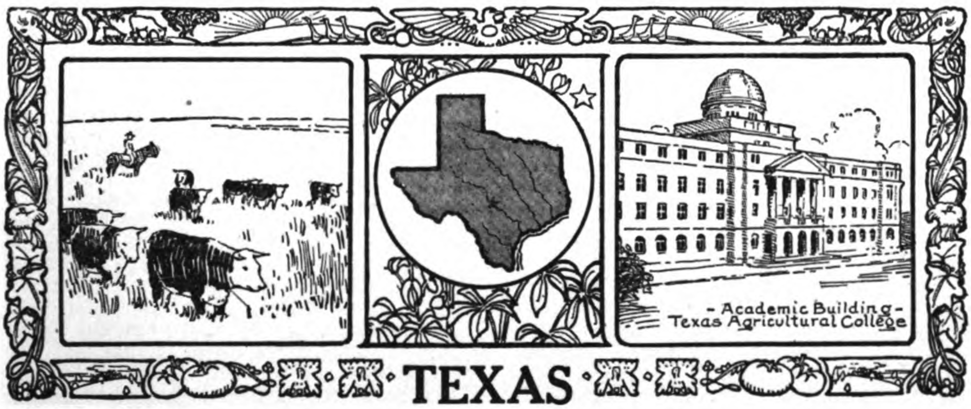
2. Crop Acreages, Yields, Values, 1910 and *1917*.

Value all crops		$120,706,211
Value all cereals		55,302,278
Corn, acres	3,146,348;	*3,900,000*
bushels	67,682,489;	*111,150,000*
value	$55,055,000;	*$133,380,000*
av. yield per acre (10 years), bushels		25.0
Wheat, acres	619,861;	*525,000*
bushels	6,516,539;	*4,830,000*
value	$9,568,000;	*$10,723,000*
av. yield per acre (10 years), bushels		11.1
Oats, acres	342,086;	*300,000*
bushels	4,720,692;	*7,350,000*
value	$2,120,000;	*$6,100,000*
av. yield per acre (10 years), bushels		21.6

Rye, acres	22,798;		*12,000*
bushels	140,925;		*120,000*
value	$83,000;		*$234,000*
av. yield per acre (10 years), bushels			11.3
Buckwheat, acres	2,867;	bushels,	33,249
Barley, acres	2,567;	"	53,201
	6,000;	"	*120,000*
Dry peas, acres	36,640;	"	133,924
Dry beans, acres	3,398;	"	19,526
	10,000;	"	*60,000*
Peanuts, acres	18,952;	"	547,240
	15,000;	"	*450,000*
Value other grains and seeds			$771,123
Hay and forage, value			$12,617,538
acres			1,052,816
tons			1,077,836
Value vegetables			10,430,975
Value other crops			37,098,016
Potatoes, acres	40,963;	bushels,	2,922,713
	52,000;		*4,888,000*
Sweet potatoes and yams, acres	26,216;	"	2,504,490
	30,000;	"	*2,850,000*
Tobacco, acres	*101,000;*	pounds,	68,756,599
			81,810,000
Cotton, acres	787,516;	bales,	264,562
	857,000;	"	*206,000*
Cane, sorghum, acres	52,907;	tons,	205,901
sirup made, gallons			2,076,339
Broom corn, acres	1,348;	pounds,	347,064
Value fruits and nuts			$4,486,281
Apples, trees	4,838,922;	bushels,	4,640,444
			5,000,000
Peaches, nectarines, trees	3,163,737;	"	1,579,019
			900,000
Pears, trees	233,407;	"	83,557
			75,000
Plums and prunes, trees	499,627;	bushels,	139,093
Cherries, trees	201,830;	"	36,303
Quinces, trees	17,159;	"	4,421
Grapes, vines	338,758;	pounds,	1,979,480
Figs, trees	2,287;	"	68,535
Small fruits, acres	12,539;	quarts,	13,895,493
Nuts, trees	24,926;	pounds,	783,570

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			234,060
Value of domestic animals			$106,608,122
Cattle, number	996,529;	value,	$20,690,718
	894,000;	"	*29,202,000*
Dairy cows, number	397,104;		
	366,000;	"	*15,738,000*
Horses, number	349,709;	"	39,320,044
	350,000;	"	*36,750,000*
Mules, number	275,855;	"	35,100,810
	270,000;	"	*32,400,000*
Asses and burros, number	7,989;	"	1,075,066
Swine, number	1,387,938;	"	7,329,622
	1,485,000;	"	*12,474,000*
Sheep, number	795,033;	"	3,009,196
	650,000;	"	*3,770,000*
Goats, number	43,560;	"	82,666
Poultry, number	8,056,145;	"	3,757,337
Bees, colonies	144,481;	"	340,619
Milk produced, gallons			117,101,970
Butter produced, pounds			39,827,906
Value dairy products			$8,715,441
Value poultry products			12,192,287
Value animals sold			37,537,861
Value animals slaughtered			12,209,506



TEXAS ("Lone Star State"), one of the South Central States, lies between 25 and 37 degrees north latitude, 93 and 107 degrees west longitude. The Red River on the north, the Sabine River on the east, and the Rio Grande on the southwest form a considerable part of its boundaries. Its extreme dimensions are 780 miles from east to west and 750 miles from north to south. Area, 265,896 square miles, 3,498 of which are water. It far exceeds any other State in area.

Land surface. Along the coast this is low, and fringed with numerous low, sandy islands with shallow sounds or bays. Next comes the prairie belt about 150 miles in width, of an undulating surface with extensive belts of forest. Beyond this is the Great Plains region, with a more broken surface, less timber and other vegetable growth than the prairies, and a higher altitude. In the northwest is the Llano Estacado or Staked Plain, a semi-arid plateau, 2,000 to 4,500 feet elevation. West of the Pecos River, it is mountainous, spurs of the Rocky Mountains rising to a general elevation of more than 2,000 feet and to 5,000 to 6,000 feet in several mesas. Numerous rivers all flow toward the southeast except the Canadian, which flows east across the extreme northern part. The largest are the Neches, Trinity, Brazos, Colorado, San Antonio and Nueces.

Soils. Along the coast these are sandy; in

the prairie region, they are a mixture of sand and clay with considerable humus; farther north and west are limestone and clay soils; in the great forest region of eastern Texas and extending to the west along the Red River Valley are sandy soils underlaid with red and yellow clay; in the north are loam soils often mixed with clay, which becomes very sticky when wet. Nearly all can be profitably cultivated.

Climate. Along the coast, the temperature averages high, but without great variations. Galveston is typical, with a highest recorded temperature of 98 degrees; lowest, 8 degrees, average annual temperature 69.8 degrees. The frost-free season here usually covers all but parts of December and January, and some seasons there are no killing frosts. The average annual rainfall is about 47 inches. Hurricanes are liable to occur during the late summer and early autumn months. In the interior there are greater variations. In central Texas, extremes of from 116 above to 12 degrees below zero have been recorded, and average annual temperatures of 62.9 to 67.7 degrees. The average annual rainfall varies from about 20 inches in the western part to 33 inches in the eastern; snowfall is light. The frost-free season usually covers about 8 months. The northern part is subject to sudden and extreme changes in temperature. Extremes are 23 degrees below zero and 116 degrees above. The average annual rainfall ranges from 16 inches in the northwestern part of the Panhandle to 30 in the southeast.

Opportunities. There is considerable public land on the market, not well suited for general agricultural purposes, but good for ranching. Information about this may be obtained from the General Land Office, Austin. Numerous irrigation projects, supplied both by stored water and from wells, are found in different parts the State.

Products and industries. Texas is preëminently an agricultural state. Its products cover a wide range. The leading grains are corn, oats, wheat, rice and barley. Potatoes and sweet potatoes are largely grown. Cotton is the leading crop, and sugar cane is raised in limited areas in the Brazos, Colorado and Rio Grande Valleys. Rice is grown extensively under irrigation in the southeastern part. Fruit growing is extensive in the eastern part of the state. Peaches are grown on sandy or sandy loam soils throughout the state. Apples are grown in a limited way. Grapes are adapted but not grown extensively. Dewberries and blackberries are well adapted. Strawberries lead among the small fruits. Among citrus fruits, the Satsuma orange and the grapefruit are reasonably well adapted, but frequently suffer from frost. Truck farming is carried on extensively in the Rio Grande Valley, the Gulf Coastal Plain, certain parts of eastern Texas, and in the territory adjacent to the towns and cities of any importance. The leading livestock are cattle, horses, mules, swine, sheep and Angora goats. More mules are raised than in any other state, and Texas is the greatest mohair-producing state in the Union. The number of dairy cows has increased largely. The value of poultry products exceeds that of dairy products. Lumbering is an important industry, about one fourth of the state being wooded. The great forest region of eastern Texas is said to be one of the richest forests in America. Fisheries are unimportant. The principal minerals are petroleum and coal. Main manufactures are flour and grist-mill products, cottonseed oil and cake, lumber and timber products, meat products, cars and railroad construction, petroleum refining, foundry and machine-shop products. Leading manufacturing towns are Dallas, Houston, San Antonio and Fort Worth.

Transportation and markets. The eastern part is well covered with railroads, the rest of the state fairly well. Dallas, Fort Worth and Houston are important railroad centers and markets. Galveston, the only port of entry, is first among southern ports in value of exports, and is exceeded by New York City alone. Cotton is the leading export.

History. The first explorers were Spaniards from Mexico during the sixteenth century. After the Louisiana Purchase, 1803, American colonists came in large numbers, and trouble over the boundary resulted in Spain's rights to the territory as far as the Sabine River being recognized. Texas, with two other divisions, was made a separate state; a revolt ensued, then open warfare, and final victory for Texas, April 21, 1836. In September a constitution was adopted, General Sam Houston was chosen Governor, and Austin made the state capital. Then followed overtures for annexation to the United States, but this was not accomplished till 1845. The question of the western boundary brought on the Mexican War, which closed in 1848 with the Rio Grande recognized as the boundary. Texas seceded February 1, 1861. It was readmitted to the Union, March 30, 1870. September 8, 1900, Galveston was visited by a hurricane which destroyed 6,000 lives and $18,000,000 in property. Capital, Austin; population, 1910, 29,860.

Agricultural organization. Agricultural and Mechanical College and Experiment Station, *College Station*. Sub-stations, *Beeville, Denton, Lubbock, Chillicothe, Troupe, Beaumont, Nagadoches, Pecos, Temple, Angleton, Spur, Sonora* and *College Station*. Normal and Industrial College, *Prairie View*. Coöperative Demonstration Work, *College Station*. Department of Agriculture, *Austin*. The State Fair is held at *Dallas*.

Statistics

1. Farms and Farm Property, 1910 and *1900*

	1910	*1900*
Population	3,896,542	*3,048,710*
White	3,204,848	
Colored	690,049	
Other non-white	1,645	
(City, 938,104; country, 2,958,438)		
Number farmers	417,770	*352,190*
(White, 347,852; negro and other non-white, 69,918)		
Land area, acres	167,934,720	
Acres in farms	112,435,067	*125,807,017*
Acres farm land improved	27,360,666	*19,576,076*
Average acres per farm	269.1 (65.5 acres improved)	
Farms by size:		
50 to 99 acres	112,237	
20 " 49 "	98,583	
100 " 174 "	94,574	
175 " 259 "	31,864	
260 " 499 "	27,185	
10 " 19 "	19,891	
Value farm property	$2,218,645,164	*$962,476,273*
Per cent increase in 10 years	130.5	
" value farm property in land	73.6	
" " " " " buildings	9.5	
" " " " " stock and tools	17.0	
Average value all property per farm	$5,311	
Average value land per acre	$14.53	*$4.70*
Per cent of farms run by owners	46.9	
" " " " " tenants	52.6	
" " " " " managers	.6	

2. Crop Acreages, Yields, Values, 1910 and *1917*

	1910	*1917*
Value all crops	$298,133,466	
Value all cereals	67,109,923	
Corn, acres	5,130,052	*7,075,000*
bushels	75,498,695	*77,825,000*
value	$92,210,000	*$129,968,000*
av. yield per acre (10 years), bushels	19.9	
Oats, acres	440,001	*1,425,000*
bushels	7,034,617	*37,050,000*
value	$7,130,000	*$30,381,000*
av. yield per acre (10 years), bushels	28.4	
Wheat, acres	326,176	*1,350,000*
bushels	2,560,891	*16,200,000*
value	$5,959,000	*$34,020,000*
av. yield per acre (10 years), bushels	12.4	
Barley, acres	3,888	*9,000*
bushels	52,438	*180,000*
value	$78,000	*$247,000*
av. yield per acre (10 years), bushels	23.2	

	Acres		Yield
Kafir corn and milo maize, acres	573,384;	bushels,	5,860,444
	1,284,000;	"	*14,766,000*
Emmer and spelt, acres	4,624;	"	44,316
Dry peas, acres	46,777;	"	254,361
Peanuts, acres	64,327;	"	1,074,998
	600,000;	"	*16,200,000*
Cotton, acres	9,930,179;	bales,	2,455,174
	11,052,000;	"	*3,115,000*
Cane, sugar, acres	34,315;	tons,	307,502
Cane, sugar, sirup made, gallons	2,246,774		
Cane, sorghum, acres	55,027;	"	101,691
Cane, sorghum, sirup made, gallons	448,185		
Broom corn, acres	9,448;	pounds,	2,368,490
	4,000;	"	*1,376,000*
Value other grains and seeds			$1,621,503

Hay and forage, value			12,824,433
acres			1,311,967
tons			1,257,845
Value vegetables			12,122,255
Potatoes, acres	36,092;	bushels,	2,235,983
	46,000;	"	*2,760,000*
Sweet potatoes, yams, acres	42,010;	"	2,730,083
	84,000;	"	*6,552,000*
Value other crops			$202,150,478
Value fruits and nuts			2,304,874
Apples, trees	1,138,852;	bushels,	168,008
			345,000
Peaches, nectarines, trees	9,737,827;	"	729,631
			2,352,000
Pears, trees	558,478;	"	110,967
			280,000
Plums, prunes, trees	1,020,339;	"	75,222
Grapes, vines	712,201;	pounds,	1,802,618
Figs, trees	230,171;	"	2,411,876
Oranges, trees	42,384;	boxes,	10,694
Small fruits, acres	5,053;	quarts,	6,182,742
Pecans, trees	1,087,619;	pounds,	5,832,367

3. Livestock, 1910 and *1917*

	Number		Value
Farms reporting domestic animals			402,365
Value of domestic animals			$313,164,540
Cattle, number	6,934,586;	value,	$132,985,879
	6,657,000;	"	*242,751,000*
Dairy cows, number	1,013,867		
	1,175,000;	"	*64,038,000*
Horses, number	1,170,068;	"	84,024,635
	1,156,000;	"	*90,168,000*
Mules, number	675,558;	"	73,979,145
	760,000;	"	*78,280,000*
Asses and burros, numbers	20,408;	"	1,720,074
Swine, number	2,336,363;	"	11,639,366
	3,229,000;	"	*30,676,000*
Sheep number	1,808,709;	"	6,301,364
	2,328,000;	"	*10,243,000*
Goats, number	1,135,244;	"	2,514,077
Poultry, number	13,669,645;	"	4,806,642
Bees, colonies	238,107;	"	675,327
Milk produced, gallons			197,039,954
Butter produced, pounds			64,993,214
Value dairy products			$15,679,924
Value poultry products			16,129,509
Value animals sold			78,647,800
Value animals slaughtered			15,151,953

4. Irrigation, 1909 and *1899*

Number farms irrigated	4,150
Per cent of all farms irrigated	1
Acreage irrigated	164,283
Types of project and acreages:	
Coöperative enterprises	41,186
Commercial enterprises	73,440
Individual and partnership enterprises	49,657
Typical yields on irrigated land:	
Corn, bushels	21.1
Oats, bushels	24.0
Wheat, bushels	19.3
Kafir corn, bushels	25.5
Alfalfa, tons	3.18
Cotton, bales	.31
Potatoes, bushels	93.7
Sugar cane, tons	20.84

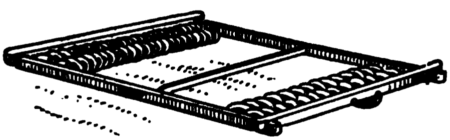
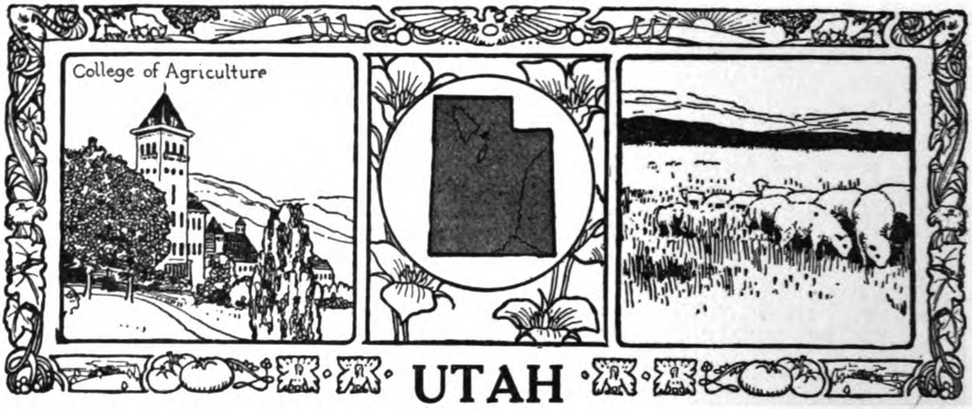


Fig. 376. A Meeker smoothing harrow



UTAH ("Salt Lake State"), a Western State, lies between 37 and 42 degrees north latitude, and 109 and 115 degrees west longitude. It is bounded north by Idaho and Wyoming, east by Wyoming and Colorado, south by Arizona, west by Nevada. Its boundaries are all straight lines; it has no natural boundaries. Its extreme dimensions are 345 miles and 275 miles. Area, 84,970 square miles, 2,806 of which are water.

Land surface. The Wasatch Mountains traverse the center of the state from north to south. The Uintah Mountains extend to the east from these in the north. In the latter are the highest points in the state, Gilbert, 13,422 feet; Kingspeak, 13,498, highest peak in state; Hodges, Wilson, 13,815; Lovenia and Tokewanna, 13,200 feet. The Wasatch Mountains are 8,000 to 11,500 feet above sea level. East and west of the mountains are elevated plateaus of 4,000 to 6,000 feet. Short mountain ranges of lower elevations jut out from the main chain both east and west. West of the mountains is the Great Basin which extends beyond the state, the great American Desert in the northern part. Between this desert and the mountains is Great Salt Lake, about 75 miles long and 20 to 50 miles wide, with an area of 2,000 square miles, the largest salt lake in America. Most of eastern Utah is drained by the Colorado River and its tributaries. There are several smaller salt lakes.

Soils. The agricultural soils are largely deep, rich, alluvial, loamy or clayey, though near the mountain cañons, gravelly or sandy lands are found. Practically all the farming of the state is done in the various mountain valleys in the center of the state. Most of the soils are very fertile, and yield abundantly when supplied with irrigation water, but some sections are useless for agricultural purposes, unless reeclaimed, because of excessive accumulations of alkali. About 70 per cent of the cultivated area, or nearly 90 per cent of the farms, is irrigated.

Climate. Changes in temperature are extreme; in some sections, hot days are followed by cool nights, with low temperatures in winter. Yet the dryness of the air is conducive to health. Temperatures vary greatly at different elevations; the highest recorded is 116 degrees, the lowest 38 degrees below zero. The average annual temperature of the eastern section is 49.8 degrees; of the western and southern 49.3 degrees; of the middle, 47.2 degrees. The frost-free season varies widely. At Salt Lake City, it averages about 170 days, while at some stations, it is nearly 2 months shorter. The average annual rainfall varies from 5.43 inches at one station to 24.36 at another. Most of the precipitation falls as snow during the winter and in spring. The snowfall is light except on the mountains.

Opportunities. New land is being brought under cultivation by both dry and irrigation farming methods. On June 30, 1917, 13,846,826 acres were surveyed and awaited homestead settlers. During 1916 and 1917, about 298,877 acres were entered by homesteading. About 17,500,000 acres susceptible to agricultural development were unappropriated in 1914. Unappropriated surveyed public lands, July 1, 1914, 12,411,611 acres. The land offices are at Salt Lake City. The State Industrial Commission collects and distributes information concerning the state. In 1917, about 320,000 acres were under private irrigation projects, and others are being opened continually. The first irrigation by white people in America was begun near Salt Lake City in 1847. Dry-farming also originated in Utah.

Products and industries. There is a large variety of agricultural products. The leading grain crops are wheat and oats. Hay is an important crop, largely alfalfa. Large quantities of sugar beets are grown, mostly in the north and central parts. Utah ranks third of the states in the production of beet sugar. Potatoes are the most important vege-

table. Tomatoes and other crops for the canning factories are raised largely in the north. Fruits are grown extensively in several valleys, apples, pears and peaches leading, with the earlier varieties of grapes. Figs are grown in the southwest. Cattle and sheep are the leading livestock, though horses exceed these in value. Lumbering is unimportant, the only merchantable timber being in the Uintah Mountains. There are 14 U. S. Forest Reserves. Leading minerals are gold, silver, copper, lead and coal. Main manufactures are copper smelting and refining, flour and grist-mill products, railway repairs, confectionery, cheese, butter and condensed milk, canned and preserved fruits, beet sugar, meat products, salt.

Transportation and markets. Much of the state is deficient in transportation facilities. Electric railways cover the northern half of the state. There is very little water communication. Much of the produce is sold on the local markets, the mines drawing heavily on the farms for supplies.

History. The earliest explorers were the Spaniards who came by way of the Colorado River in the south about 1540. Great Salt Lake was discovered by Captain James Bridger in 1824. The first expeditions of which records were left were of Captain Bonneville, 1832–6, and John C. Fremont, 1842–3. The first settlement was made at Salt Lake City in July, 1847, by a band of about 150 Mormons under Brigham Young. The population increased rapidly, reaching 11,380 by 1850. The territory passed into the control of the United States in 1848. Efforts to secure statehood began in 1849; the territory of Utah was organized in 1850, but Utah was not admitted as a state until 1896. Capital, Salt Lake City; population, 1910, 92,777.

Agricultural organization. Agricultural College and Experiment Station and Coöperative Demonstration Work, *Logan*. There are the State Board of Land Commissioners, State Live Stock Commission, State Crop Pest Commission, State Board of Horse Commissioners, State and County Farm Bureaus, State Horticultural Society, State Dairymen's Association, State Irrigation Congress, State Dry Farmers' Association, State Beekeepers' Association. The State Fair is held at *Salt Lake City*. The Experiment Station Director reports that agriculture is increasing rapidly in the state. New dry-farming areas are being brought into cultivation. Irrigation areas are being extended by better methods, by the storage of water, and by pumping water for irrigation. The sugar-beet area is being greatly increased. Dairying is finding a larger place. Rotations, better cultural methods, better farm organization, the better use of irrigation water and other improvements are making the agriculture of the state better every year.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	373,351; *276,749*
White	366,583
Indian	3,123
Other non-white	3,645
(City, 172,934; country, 200,417)	
Number farmers	21,676; *19,387*
(White, 21,400; negro and other non-white, 276)	
Land area, acres	52,597,760
Acres in farms	3,397,699; *4,116,951*
Acres farm land improved	1,368,211; *1,032,117*
Average acres per farm	156.7 (63.1 acres improved)
Farms by size:	
20 to 49 acres	5,550
50 " 99 "	4,170
100 " 174 "	3,660
10 " 19 "	2,541
3 " 9 "	1,836
175 " 259 "	1,372
260 " 499 "	1,309
Value farm property	$150,795,201; *$75,175,141*
Per cent increase in 10 years	100.6
" value of farm property in land	66.0
" " " " " " buildings	12.0
" " " " " " stock and tools	22.1
Average value all property per farm	$6,957
Average value land per acre	$29.28; *$9.75*
Per cent of farms run by owners	91.2
" " " " " tenants	7.9
" " " " " managers	.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$18,484,615
Value all cereals			6,092,281
Wheat, acres	178,423;		*320,000*
bushels	3,943,910;		*5,650,000*
value	$5,481,000;		*$10,057,000*
av. yield per acre (10 years), bushels			24.7
Oats, acres	80,816;		*100,000*
bushels	3,221,289;		*4,400,000*
value	$1,319,000;		*$3,740,000*
av. yield per acre (10 years), bushels			46.1
Barley, acres	26,752;		*33,000*
bushels	891,471;		*1,221,000*
value	$343,000;		*$1,465,000*
av. yield per acre (10 years), bushels			41
Corn, acres	7,267;		*20,000*
bushels	169,688;		*500,000*
value	$355,000;		*$850,000*
av. yield per acre (10 years), bushels			31.8
Rye, acres	5,234;		*13,000*
bushels	65,754;		*104,000*
value	$46,000;		*$166,000*
av. yield per acre (10 years), bushels			16.8
Value other grains and seeds			$330,300
Hay and forage, value			$7,429,901
acres			405,394
tons			1,015,913
Value vegetables			1,591,847
Dry beans, acres	196;	bushels,	3,352
Dry peas, acres	126;	"	3,222
Potatoes, acres	14,210;	"	2,409,093
	23,000;	"	*4,347,000*
Sugar beets, acres	27,472;	tons,	413,946
Value other crops			2,151,794
Value fruits and nuts			$888,492
Apples, trees	517,039;	bushels,	350,023
			650,000
Peaches, nectarines, trees	544,314;	"	143,237
			900,000
Pears, trees	79,355;	"	38,654
			48,000
Plums, prunes, trees	135,619;	"	68,249
Cherries, trees	79,775;	"	21,402
Apricots, trees	28,978;	"	12,047
Grapes, vines	204,445;	pounds,	1,576,363
Figs, trees	287;	"	22,164
Small fruits, acres	1,416;	quarts,	3,118,395

3. Livestock, 1910 and *1917*

Farms reporting domestic animals	20,798
Value of domestic animals	$28,330,215

	Number		Value
Cattle, number	412,334;	value,	$8,948,702
	499,000;	"	*19,790,000*
Dairy cows, number	75,810;		
	91,000;	"	*5,551,000*
Horses, number	115,676;	"	9,999,835
	138,000;	"	*12,006,000*
Mules, number	2,227;	"	157,497
	2,000;	"	*158,000*
Swine, number	64,286;	"	445,653
	101,000;	"	*1,060,000*
Sheep, number	1,827,180;	"	8,634,735
	2,089,000;	"	*16,503,000*
Goats, number	29,014;	"	75,547
Poultry, number	691,941;	"	327,908
Bees, colonies	26,185;	"	123,568
Milk produced, gallons			20,486,317
Butter produced, pounds			2,497,366
Value dairy products			$2,067,534
Value poultry products			1,259,267
Value animals sold			5,899,382
Value animals slaughtered			756,854

4. Irrigation, 1909 and *1899*

Number farms irrigated	19,709
Per cent of all farms irrigated	90.9
Acreage irrigated	999,410
Types of project and acreages:	
U. S. Indian Service	11,520
Carey Act Enterprises	5,000
Irrigation districts	8,455
Coöperative enterprises	687,260
Commercial enterprises	64,727
Individual and partnership enterprises	222,448

Per cent of crops grown under irrigation:
Corn, 92.9; oats, 92.4; wheat, 40.5; dry peas, 27.0; barley, 59.6; timothy, 64.5; small fruits, 89.5; dry beans, 54.1; rye, 26.7; alfalfa, 88.0; alfalfa seed, 60.8; potatoes, 93.3; sugar beets, 94.8.

Yields:	Irrigated	Non-irrigated
Oats, bushels	41.1	25.4
Wheat, bushels	28.5	17.8
Barley, bushels	42.6	19.7
Alfalfa, tons	2.90	1.97
Alfalfa seed	2.19	1.76
Sugar beets, tons	15.13	13.92
Timothy, tons	2.18	1.76

VERMONT

VERMONT ("Green Mountain State"), a New England State lies between 42 and 45 degrees north latitude, and 71 and 74 degrees west longitude. The eastern boundary is formed by the Connecticut River, and the larger part of the western by Lake Champlain and the Poultney River. Lake Memphremagog lies on the northern border. Area, 9,564 square miles, 440 of which are water.

Land surface. The average elevation is about 1,000 feet above sea level. The surface is largely mountains, high hills and deep, narrow valleys. The Green Mountains extend the length of the State from North to South, separating the Connecticut from the Hudson River and Lake Champlain. The highest elevation is Mount Mansfield, 4,406 feet. Several small rapid rivers flow into the Connecticut River and Lake Champlain, and two or three each into the Hudson River and Lake Memphremagog.

Soils. These are of glacial origin, those on the hills being better suited to grazing than to tillage. The valley soils are generally of good quality and very fertile. Alluvial soils are found along the streams.

Climate. The winters are somewhat long and cold, the snowfall usually deep, and summers relatively short. Yet the climate is healthful, and most delightful in summer. The highest recorded temperature is 100 degrees, and the lowest 44 degrees below zero. Warm days are followed by cool nights. The average annual frost-free season is about 135 days, but in the higher altitudes, frosts have occurred, in some years, every month. The average annual snowfall varies from 63.6 inches at one station to 110.6 inches at another. The average annual rainfall is 38.7 inches, a large part in the form of snow. Freshets from melting snow are common in spring, sometimes destructive. The winter winds are often severe.

Opportunities. There are practically no abandoned farms, and no untaken public land suitable for agriculture. Particulars about agricultural and other opportunities may be obtained from the Secretary of State, Montpelier.

Products and industries. Vermont is not a grain-growing state, and most of the grain grown is fed on the farms. Oats and corn are the leading grains, though hay and forage exceed the value of all the cereals 6 times over. Potatoes exceed in value any of the cereals. Vermont furnishes nearly one-third of the world's supply of maple sugar and sirup, most of it being produced in its northern counties. Cattle are the leading livestock, dairy cows being the larger number. Vermont has always been famed for its horses, and these exceed all other livestock except cattle. Sheep and swine are of considerable importance. Apples are the leading fruit, being grown largely in the Champlain Valley including several islands in the north, in the Hudson River Valley and, to a less extent, in the Connecticut River Valley. A few truck gardens are found in the vicinity of the cities and summer resorts, as are small fruits, but no truck or small fruits are grown on a large commercial scale. Lumbering is an important industry, a considerable proportion of the State still being covered with forests. The leading minerals are marble, granite, slate and talc. Main manufactures are marble and stone products, lumber and timber products, market milk, butter, cheese, sweet cream and condensed milk, woolen, worsted and felt goods, flour and grist-mill products, foundry and machine-shop products. Water power for manufacturing is abundant.

Transportation and markets. Vermont is well covered by railroads. Lake Champlain furnishes excellent water communication. Newport and St. Albans are the main ports of entry, and do an extensive business, exports in general far exceeding imports.

History. The Lake Champlain region was first explored by the French under Champlain in 1609, though Cartier may have seen it from Mount Royal at Montreal in 1535. The first settlement was made by the French in 1666 at Fort Saint Anne on Isle La Motte. The first English settlement was made near the present site of Brattleboro in 1724 by Massachusetts colonists. Many other settlements were made during the next half century. In 1759, the French abandoned their settlements which were few and confined to the Champlain Valley. There was much conflict over boundaries because of different grants made by the governors of New York and New Hampshire. Although the boundary dispute was settled in favor of New York, the British Government did not intend to invalidate the titles of lands granted by governor Wentworth of New Hampshire and actually occupied by settlers. New York Governors, however, persisted in regranting these lands, or in making the settlers buy them again at prices considerably larger than those originally paid. The hardy pioneers refused to submit to what they considered a gross injustice, and drove off the New York officials who attempted to evict them. A military organization known as the Green Mountain Boys, and led by Ethan Allen, Seth Warner and others was vigilant in defending the people of New Hampshire Grants, as this region was then known. Trouble continued with New York until after the close of the Revolution. A convention held at Westminster January 15, 1777, declared the Grants to be the independent state of New Connecticut. A later convention changed the name to Vermont, adopted the substance of the Pennsylvania constitution, and declared slavery illegal. On February 18, 1791, Vermont became the first state admitted under the Federal Constitution. Capital, Montpelier; population, 1910, 7,856.

Agricultural organization. College of Agriculture and Experiment Station, and Coöperative Demonstration Work, *Burlington*. Commissioner of Agriculture and ex-officio State Forester, State Nursery Inspector, Live Stock Commissioner, State Ornithologist and State Forester, all *St. Albans*. There are, also, a State Grange, Beekeepers', Dairymen's, Forestry, Maple Sugar Makers' and Poultry Breeders' Associations and Horticultural Society. The State Fair is held at *White River Junction*.

The Dean of the State College reports that, "As heretofore, our main products are dairy and lumber products. Our state, within the last ten years, has rapidly changed from a butter to a market-milk state; while a large amount of butter is still made, increasingly the milk leaves the state as such. There has been no development in new systems or rotations, or the exploitation of new lands."

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	355,956; *343,641*
White,	354,298
Colored	1,621
Other non-white	37
(City, 168,943; country, 187,013)	
Number farms	32,709; *33,104*
(White, 32,689; non-white, 20)	
Land area, acres	5,839,360
Acres in farms	4,663,577; *4,724,440*
Acres farm land improved	1,633,965; *2,126,624*
Average acres per farm	142.6 (50 acres improved)
Farms by size:	
100 to 174 acres	9,492
50 " 99 "	5,910
175 " 259 "	5,194
20 " 49 "	3,481
260 " 449 "	3,322
3 " 9 "	2,581
Value farm property	$145,399,728; *$108,451,427*
Per cent increase in 10 years	34.1
" value of farm property in land	40.2
" " " " " " buildings	37.3
" " " " " " stock and tools	22.6
Average value all property per farm	$4,445
Average value land per acre	$12.52; *$9.70*
Per cent of farms run by owners	85.8
" " " " " tenants	12.13
" " " " " managers	1.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$27,446,836
Value all cereals	2,651,877

Oats, acres	71,510;	*88,000*
bushels	2,141,357;	*3,168,000*
value	$1,304,000;	*$2,693,000*
av. yield per acre (10 years), bushels		37.6
Corn, acres	42,887	*54,000*
bushels	1,715,133;	*2,538,000*
value	$1,756,000;	*$5,406,000*
av. yield per acre (10 years), bushels		41.0
Barley, acres	10,586;	*17,000*
bushels	285,008;	*493,000*
value	$346,000;	*$690,000*
av. yield per acre (10 years), bushels		31.7
Buckwheat, acres	7,659;	*13,000*
bushels	174,394;	*286,000*
value	$134,000;	*$429,000*
av. yield per acre (10 years), bushels		24.2
Rye, acres	1,115;	*1,000*
bushels	16,689;	*20,000*
value	$31,000;	*$35,000*
av. yield per acre (10 years), bushels		18.2
Wheat, acres	678;	*3,000*
bushels	14,087;	*60,000*
value	$30,000;	*$142,000*
av. yield per acre (10 years), bushels		26.2
Value other grains and seeds		$79,211
Hay and forage, value		$16,335,530
acres		1,030,618
tons		1,502,730
Potatoes, acres	26,859;	*30,000*
bushels	4,145,630;	*3,000,000*
value		*$4,200,000*
Value vegetables		$2,615,299
Tobacco, acres	103; pounds,	164,680
	100; "	*165,000*
Value other crops		$4,854,038
Maple, trees		5,585,632
sugar made, pounds		7,726,817

Maple sirup made, gallons			409,953
Value fruits and nuts			$910,881
Apples, trees	1,183,529;	bushels,	1,459,689
			1,286,000
Peaches, nectarines, trees	5,492;	"	2,221
Pears, trees	26,315;	"	20,763
			14,000
Plums, prunes, trees	32,920;	"	7,205
Cherries, trees	18,006;	"	2,506
Grapes, vines	9,318;	pounds,	203,011
Small fruits, acres	469;	quarts,	826,122
Nuts, trees	24,534;	pounds,	891,825

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			30,375
Value of domestic animals			$21,990,630
Cattle, number	430,314;	value,	$11,828,892
	453,000;	"	*21,982,000*
Dairy cows, number	265,483;	"	*17,562,000*
	281,000;	"	
Horses, number	80,781;	"	8,591,357
	89,000;	"	*11,926,000*
Mules, number	429;	"	53,540
Swine, number	94,821;	"	974,479
	113,000;	"	*1,469,000*
Sheep, number	118,551;	"	538,991
	100,000;	"	*730,000*
Goats, number	261;	"	1,033
Poultry, number	938,524;	"	607,787
Bees, colonies	10,215;	"	44,349
Milk produced, gallons			114,317,169
Butter produced, pounds			15,165,692
Value dairy products			$12,128,465
Value poultry products			2,287,710
Value animals sold			5,990,550
Value animals slaughtered			1,468,345

VIRGINIA ("Old Dominion State"), a South Atlantic State, lies between 36 and 40 degrees north latitude, and 75 and 84 degrees west longitude. The Potomac River and Chesapeake Bay form the Maryland boundary line on the northeast. Area, 42,627 square miles, 2,635 of which are water.

Land surface. This forms three distinct regions: the Coastal Plain, the Piedmont Plain and the Appalachian Plateau. The first slopes gradually from sea level to about 500 feet at the beginning of the Piedmont Plain which rises more abruptly and brokenly to about 1,000 feet at the beginning of the Appalachian Plateau. The last includes the Blue Ridge Mountains, elevation about 2,500 feet, and the Allegheny Mountains on the western boundary, with elevations up to 5,719 feet in Rogers Mountain. Between these ranges is the Great or Shenandoah Valley drained by the Shenandoah River flowing into the Potomac. The Rappahannock, York and James are the other principal rivers flowing into Chesapeake Bay. In the southeast is the Great Dismal Swamp, containing Lake Drummond.

Soils. There is great variety in the different sections. Those in the Coastal Plain

are generally light, sandy and gravelly, with some clay. The soils of the Piedmont Region are heavier, well suited to grain, fruit and livestock. In the Shenandoah and tributary valleys are the most fertile soils of the state, largely limestone clays suited to general farming. Alluvial soils are found along the rivers. The mountain and valley soils are suitable for the growth of bluegrass.

Climate. The climate generally is equable and healthful except in some of the low-lying coast regions. The mountain regions are pleasant and healthful throughout the year. Along the coast the weather is hot and sultry in summer. The average annual temperature of the state is about 59 degrees. The average winter temperature is about 40 degrees. The highest recorded temperature is 108 degrees, the lowest, 21 degrees below zero. The average annual rainfall is 52 inches at Norfolk; 24.8 inches at Lynchburg; 38 inches at Staunton. The snowfall is light except in the mountains and nowhere excessive. Average frost-free season about 200 days. Severe or destructive storms are rare.

Opportunities. There is no untaken public land suitable for farming, and there are no abandoned farms. But there is a great deal of land cultivated before the Civil War but now idle a long time, which can be bought at a low price, and responds well to good treatment. A large area in Dismal Swamp could be made into excellent farming land by drainage. Information can be obtained of the Agricultural Experiment Station, Blacksburg, or the State Department of Agriculture and Immigration, Richmond.

Products and industries. Agricultural products are varied because of the variety of soils, elevations and local conditions. The leading grains are corn, wheat and oats. Great quantities of peanuts are grown. Potatoes, sweet potatoes and tobacco are largely grown, and lesser amounts of cotton and sorghum cane. Hay and forage are largely produced. Immense quantities of vegetables are grown, for the northern markets. The leading fruit is apples, some of the finest being grown in the mountain regions; next come peaches, pears, plums and grapes. Strawberries are the most important small fruit. In value of livestock, horses lead, followed by cattle, swine and sheep, though poultry exceed the latter in value. Dairying is important and increasing except in the coast regions. Lumbering has reduced the supply of both pine and hard woods, so is not so important as formerly. In fisheries, Virginia is near the top of the states in value of products, oysters furnishing the largest item in value. The leading minerals are coal and iron. Manufactures have increased largely in recent years. Main ones in order of their value are lumber and timber products, tobacco, flour and grist-mill products, railroad shop construction, leather, fertilizers, peanut products, cotton goods, boots and shoes, foundry and machine-shop products, iron and steel.

Transportation and markets. Facilities for transportation are excellent both by rail and water. Improved highways are being constructed in nearly all counties. The numerous bays and broad river mouths are great aids in water communication. The coastwise trade is extensive, and great quantities of vegetables and fruits are sent to the northern markets by water. Alexandria, Newport News, Norfolk, Petersburg, and Richmond are ports of entry, most of the business being done by Newport News and Norfolk. The exports far exceed in value the imports.

History. The first permanent English settlement in America was in Virginia, at Jamestown in 1607. The first colonists nearly starved to death, being reduced during the winter of 1609–10 from 500 to 60. On July 30, 1619, the first representative assembly in America met at Jamestown. In 1619, the first slaves were brought into the colony. During the war of Independence, Virginia was invaded many times, and the final campaign centered around Yorktown in 1781. The Virginia Assembly passed a resolution favoring a joint convention of delegates from the various states, which resulted in the Annapolis Convention of September, 1786, which issued the call for the convention that framed the Federal Constitution, 1787. This constitution was ratified by the State, 1788. A majority of the people opposed secession, but when Lincoln issued his call for troops, a state convention passed the ordinance of secession, April 25, 1861. Later the people of the eastern part voted approval, but those of the western part repudiated the ordinance, and took steps to form the State of West Virginia. Richmond became the capital of the Confederacy. Virginia was the chief battleground of the Civil War, and Lee's surrender, which terminated the war, occurred in the State, at Appomattox. Virginia again became a member of the Union in 1870. Capital, Richmond; population, 1910, 127,-628.

Agricultural organization. Agricultural and Mechanical College and Experiment Station, *Blacksburg;* Truck Station, *Norfolk;* County Stations, *Appomattox, Williamsburg, Charlotte, Bowling Green, Holland, Chatham, Martinsville, Staunton.* Coöperative Demonstration Work, *Washington, D. C.* State Department of Agriculture and Immigration, *Richmond.* There are a State Farmers' Institute, State Horticultural Society and other organizations. The State Fair is held at *Richmond.* The Agricultural College and Experiment Station have greatly aided in the advancement of agricultural interests of the state, and they stand ready to help farmers at all times.

Statistics

1. Farms and Farm Property, 1910 and *1900*

	1910	*1900*
Population	2,061,612	*1,854,184*
White	1,389,809	
Colored	671,096	
Other non-white	707	
(City, 476,529; country, 1,585,083)		
Numbers farmers	184,018	*167,886*
(White, 135,904; non-white, 48,114)		
Land area, acres	25,767,680	
Acres in farms	19,495,636	*19,907,883*
Acres farm land improved	9,870,058	*10,094,805*
Average acres per farm	105.9 (53.6 acres improved)	
Farms by size:		
20 to 49 acres	42,390	
50 " 99 "	38,342	
100 " 174 "	32,997	
10 " 19 "	22,055	
3 " 9 "	17,464	
175 " 259 "	14,963	
Value farm property	$625,065,383	*$323,515,977*
Per cent increase in 10 years	93.2	
" value farm property in land	63.1	
" " " " " buildings	22.0	
" " " " " stock and tools	14.9	
Average value all property per farm	$3,397	
Average value land per acre	$20.24	*$10.08*
Per cent of farms run by owners	72.6	
" " " " " tenants	26.5	
" " " " " managers	0.9	

2. Crop Acreages, Yields, Values, 1910 and *1917*

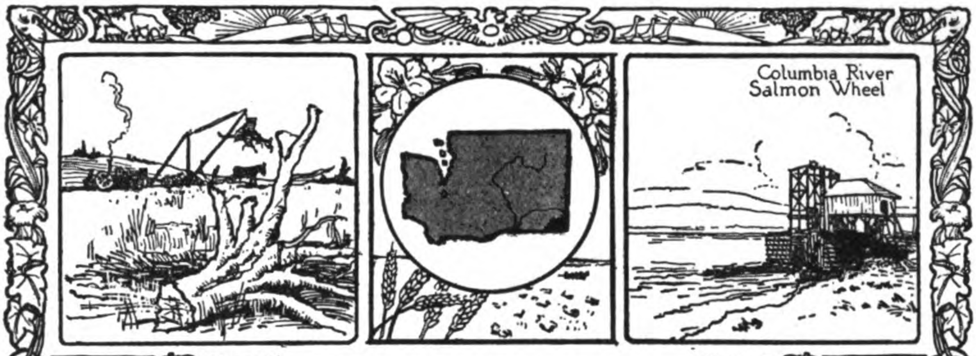
	1910	*1917*
Value all crops	$100,531,157	
Value all cereals	39,993,929	
Corn, acres	1,860,359	*2,450,000*
bushels	38,295,141	*72,275,000*
value	$35,023,000	*$110,581,000*
av. yield per acre (10 years), bushels	25.1	
Wheat, acres	692,907	*1,280,000*
bushels	8,076,989	*17,920,000*
value	$10,175,000	*$38,707,000*
av. yield per acre (10 years), bushels	12.6	
Oats, acres	204,455	*225,000*
bushels	2,884,495	*5,512,000*
value	$2,052,000	*$4,630,000*
av. yield per acre (10 years), bushels	20.7	
Rye, acres	47,890	*77,000*
bushels	438,345	*1,155,000*
value	$155,000	*$2,021,000*
av. yield per acre (10 years), bushels	12.9	

Peanuts, acres	145,213;	bushels,	4,284,340
	165,000;	"	*5,775,000*
Dry peas, acres	12,091;	"	66,488
Dry beans, acres	4,777;	"	29,435
Value other grains and seeds			$4,510,946
Hay and forage, value			10,256,993
acres			773,577
tons			823,383
Value vegetables			17,338,496
Potatoes, acres	86,927;	bushels,	8,770,778
	200,000;	"	*19,800,000*
Sweet potatoes and yams, acres	40,838;	"	5,270,202
	40,000;	"	*4,160,000*
Cotton, acres	25,147;	bales,	10,480
	45,000;	"	*16,000*
Tobacco, acres	185,427;	pounds,	132,979,390
	185,000;	"	*129,500,000*
Cane, sorghum, acres	8,288;	tons,	41,449
sirup made, gallons	441,189		
Value other crops			$23,988,454
Value fruits and nuts			4,442,334
Apples, trees	7,004,548;	bushels,	6,103,941
			9,974,000
Peaches, nectarines, trees	1,585,505;	"	243,446
			800,000
Pears, trees	457,177;	"	74,486
			194,000
Plums, prunes, trees	171,667;	"	22,597
Cherries, trees	352,783;	"	132,671
Quinces, trees	34,256;	"	3,443
Grapes, vines	424,701;	pounds,	4,108,694
Figs, trees	10,136;	"	234,057
Small fruits, acres	7,295;	quarts,	11,342,980
Nuts, trees	53,184;	pounds,	841,572

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			175,819
Value of domestic animals			$71,192,843
Cattle, number	859,067;	value,	$21,124,071
	859,000;	"	*32,799,000*
Dairy cows, number	356,284		
	373,000;	"	*17,344,000*
Horses, number	330,424;	"	34,857,610
	361,000;	"	*36,100,000*
Mules, number	60,022;	"	7,595,516
	64,000;	"	*7,808,000*
Swine, number	797,635;	"	4,165,680
	1,023,000;	"	*9,412,000*
Sheep, number	804,873;	"	3,300,026
	686,000;	"	*4,459,000*
Goats, number	7,327;	"	28,286
Poultry, number	6,099,581;	"	3,395,962
Bees, colonies	104,005;	"	302,623
Milk produced, gallons			95,555,051
Butter produced, pounds			26,651,244
Value dairy products			$7,704,326
Value poultry products			12,430,980
Value animals sold			20,124,957
Value animals slaughtered			8,857,649

FIG. 377. A papaya orchard in Hawaii



WASHINGTON

WASHINGTON ("Chinook State"), one of the Pacific Coast States, lies between 45 and 49 degrees north latitude, and 116 and 125 degrees west longitude. The Columbia River forms most of the southern boundary, the Snake River a part of the eastern, and the Pacific Ocean the western. Its extreme length from east to west is 340 miles, and width 230 miles. Area, 59,127 square miles, 2,291 of which are water.

Land surface. The Cascade Mountains with a general elevation of about 5,000 feet, cross the state from north to south, west of the center, dividing it into two unequal parts. The Cascade Plateau varies from 50 to 100 miles in width. The highest peaks are in the south, Mt. Rainier, 14,363 feet; Mt. Adams, 12,470 feet; Mt. St. Helens, 10,000 feet. In the north, Mt. Baker, 10,827 feet; Glacier Peak, 10,436 feet. East of the mountains is largely a treeless plain with an elevation of 1,200 to 1,800 feet. The Great Plains of the Columbia River, bounded by the Columbia, Spokane and Snake Rivers, are level or undulating, cut by dry cañons. In the southeast corner, the Blue Mountains extend into the State, and in the northeast are mountain spurs. West of the Cascades is the Puget Sound region, the sound extending irregularly halfway across the state. West of this in the northwestern part are the Olympic Mountains, the highest point being Mt. Olympus, 8,150 feet. The narrow coastal plain slopes to the Pacific from the Coast Range. The Columbia is the principal river, entering the state from the northeast, making a great bend to the west, then to the southern boundary and on to the Pacific Ocean. Principal tributaries are the Yakima and Snake, besides many smaller rivers.

Soils. In general, the soils of the valleys of western Washington are composed of alluvial and glacial deposits, and are very fertile. Those of eastern Washington are largely of volcanic origin, with some glacial deposits and areas of loam from decayed vegetation, but all needing irrigation for fullest development.

Climate. The Cascade Mountains cause a wide difference in climate between the eastern and western portions. West of the mountains, the climate is ....der and the rainfall much heavier. So much of the moisture is precipitated as the prevailing westerly winds blow across the mountains, that east of these the air is much drier, and variations in temperature greater. Highest recorded temperature in the west is 105 degrees; lowest, 6 degrees below zero; the average daily range of temperature in the Puget Sound region is from 35 to 45 degrees in midwinter and from 55 to 75 degrees in midsummer. The average frost-free season is about 200 days. The annual rainfall ranges from 60 to 128 inches on the coast, 22 to 60 inches in the Puget Sound Basin and from 60 inches upward on the western slopes of the Cascades. East of the Cascades, the highest recorded temperature is 115 degrees, lowest, 32 degrees below zero; average annual temperatures vary widely, but are lower than in the west. The frost-free season is also shorter. The annual rainfall varies from 6 or 7 inches to 15 or 16 inches, and still higher on the mountains.

Opportunities. There are many irrigation projects which provide available lands for settlement. Information about these may be obtained from the U. S. Reclamation Service, Washington, D. C., or from the State Commissioner of Agriculture, Olympia.

Products and industries. Leading farm activities are the production of cereals, fruits and livestock. Leading cereals are wheat, largely in the east and southeast, oats and barley. Leading farm animals are horses, cattle, sheep and swine. Dairy cows are an important item. Fruit growing is extensive. Apples are the leading tree fruit, and the late-keeping winter varieties lead all others. Prunes and plums come next, with many

peaches, pears and cherries. The production of potatoes is large, and hops are an important special crop. Lumbering is an important industry, the forest area being large and heavily timbered. Fisheries are very extensive, this state leading all others in some years in value of the products. More than half the product is salmon. The leading mineral is coal. Main manufactures are lumber and fish products.

Transportation and markets. Transportation facilities of most of the state are excellent. Puget Sound furnishes an excellent harbor for lines of steamers to all parts of the world. The Columbia River and its tributaries combined are navigable for more than 2,000 miles. Port Townsend is a port of entry, and leads all other Pacific ports in value of exports; these largely exceed the imports.

History. This region was visited in 1592, and the Strait of Juan de Fuca was discovered and named. In 1775, the mouth of the Columbia was discovered; the river was further explored in 1792, and Puget Sound was explored by Captain George Vancouver, after whom Vancouver Island was named. The expeditions of Lewis and Clark, 1805–6, and of Fremont, 1843, furnished the first valuable information of the region. Settlements were made in 1811, 1836 and 1845, but the region was slow to develop till the construction of railroads. Oregon Territory, which included the present State of Washington, was formed in 1848. Washington Territory was formed March 2, 1853, and included parts of Idaho and Montana, its present limit being established in 1863. It became a state in 1889. Capital, Olympia; population, 1910, 6,996.

Agricultural organization. College of Agriculture and Experiment Station, *Pullman*. Western Washington Experiment Station, *Puyallup*. Coöperative Demonstration Work, *Pullman*. Commissioner of Agriculture, *Olympia*. Horticultural Association, Dairymen's Association, Beekeepers' Association, Poultry Association, Purebred Stock Breeders' Association, Northwest Live Stock Association, Grain Growers', Shippers' and Millers' Association, Creamery Operators' and Buttermakers' Association, Game Protective and Propagation Association, Game and Fish Protective Association, State Grange, Farmers' Union, State Fair Association.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,141,990	*518,103*
White	1,109,111	
Colored	6,058	
Indian	10,997	
Chinese	2,709	
Japanese	12,929	
Other non-white	186	
(City, 605,530; country, 536,460)		
Number farmers	56,192	*33,202*
(White, 55,067; non-white, 1,125)		
Land area, acres	42,775,040	
Acres in farms	11,712,235	*8,499,297*
Acres farm land improved	6,373,311	*3,465,960*
Average acres per farm	208.4 (113.4 acres improved)	
Farms by size:		
100 to 174 acres	13,884	
20 " 49 "	10,252	
50 " 99 "	7,105	
260 " 499 "	6,126	
10 " 19 "	5,373	
3 " 9 "	4,593	
Value farm property	$637,543,411	*$144,040,547*
Per cent increase in 10 years	342.6	
" value of farm property in land	81.2	
" " " " " " buildings	8.6	
" " " " " " stock and tools	10.3	
Average value all property per farm	$11,346	
Average value land per acre	$44.18	*$11.68*
Per cent of farms run by owners	84.5	
" " " " " tenants	13.7	
" " " " " managers	1.7	

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$78,927,053	
Value all cereals	44,762,138	
Wheat, acres	2,118,015	*1,855,000*
bushels	40,920,390	*29,218,000*
value	$33,275,000	*$56,391,000*
av. yield per acre (10 years), bushels	22.7	
Oats, acres	269,742	*292,000*
bushels	13,228,003	*11,242,000*
value	$4,751,000	*$9,106,000*
av. yield per acre (10 years), bushels	48.8	
Barley, acres	171,888	*170,000*
bushels	5,834,615	*4,930,000*
value	$4,601,000	*$5,670,000*
av. yield per acre (10 years), bushels	38.2	
Corn, acres	26,033	*41,000*
bushels	563,025	*1,517,000*
value	$359,000	*$2,458,000*
av. yield per acre (10 years), bushels	28.3	
Rye, acres	5,450	*7,000*
bushels	50,746	*89,000*
value	$79,000	*$156,000*
av. yield per acre (10 years), bushels	19.8	
Value other grains and seeds	$172,700	
Hay and forage, value	$17,147,648	
acres	742,137	
tons	1,391,6[illegible]4	
Value vegetables	$5,982,665	
Dry peas, acres	3,196; bushels, 91,032	
Potatoes, acres	57,897	*79,000*
bushels	7,667,171	*9,875,000*
value		*$9,085,000*
Hops, acres	2,433; pounds, 3,432,504	*3,500*; " *4,200,000*
Value other crops	$5,591,429	
Value fruits and nuts	$5,270,473	
Apples, trees	3,009,337; bushels, 2,672,100	*17,897,000*
Peaches, nectarines, trees	536,875; " 84,494	*504,000*
Pears, trees	290,676; " 310,804	*595,000*
Plums and prunes, trees	823,082; " 1,032,077	
Cherries, trees	241,038; " 131,392	
Grapes, vines	322,007; pounds, 1,704,005	
Small fruits, acres	5,508; quarts, 13,490,930	

3. Livestock, 1910 and *1917*

Farms reporting domestic animals	50,596	
Value of domestic animals	$47,370,775	

	Number	Value
Cattle, number	402,120	$12,193,465
	538,000	*24,008,000*
Dairy cows, number	186,233	
	263,000	*15,648,000*
Horses, number	280,572	29,680,849
	305,000	*28,890,000*
Mules, number	12,185	1,776,297
	18,000	*1,998,000*
Swine, number	206,135	1,674,927
	283,000	*3,141,000*
Sheep, number	475,555	1,931,170
	585,000	*4,154,000*
Goats, number	8,621	31,662
Poultry, number	2,272,775	1,367,440
Bees, colonies	33,884	126,895

Milk produced, gallons	70,083,033
Butter produced, pounds	6,751,575
Value dairy products	$8,746,041
Value poultry products	5,353,655
Value animals sold	7,771,950
Value animals slaughtered	2,477,396

4. Irrigation, 1909 and *1899*

Number farms irrigated	7,664
Per cent of all farms irrigated	13.6
Acreage irrigated	334,378
Types of project and acreages:	
U. S. Reclamation Service	55,690
U. S. Indian Service	35,000
Types of project and acreages:	
Commercial enterprises	66,911
Coöperative enterprises	81,122
Individual and partnership enterprises	95,655

Per cent of crops grown under irrigation:
Corn, 9.5; oats, 2.5; wheat, 0.3; barley, 10; timothy, 19.6; small fruits, 22.4; alfalfa, 78.5; potatoes, 15.9; sugar beets, 13.5.

Yields:	Irrigated	Non-irrigated
Corn, bushels	35.5	20.2
Oats, bushels	49.4	49.0
Wheat, bushels	28.1	19.3
Barley, bushels	28.3	34.0
Alfalfa, tons	3.9	2.9
Potatoes, bushels	167.0	125.9

WEST VIRGINIA

WEST VIRGINIA ("Panhandle State"), a South Atlantic State, lies between 37 and 41 degrees north latitude, and 77 and 83 degrees west longitude. Area, 24,170 square miles, 148 of which are water.

Land surface. Nearly the entire state is mountainous or hilly. It lies in the Allegheny Plateau. Along the southeastern boundary, are mountain ranges from which most of the surface slopes toward the Ohio River. The northeastern part is in the Potomac Valley, and the Monongahela River, which rises in the northern part, flows into Pennsylvania uniting there with the Allegheny to form the Ohio. In the southern part are other irregular mountain ranges of lesser elevation. The highest elevation is Spruce Knob, Pendleton County, 4,860 feet, while along the Ohio it ranges from 500 to 600 feet above sea level. The slopes of the southern mountain ranges are gentle for the most part. The principal rivers within the state are the Little Kanawha, Great Kanawha and Guyandotte.

Soils. These are mostly very fertile, even on the mountain slopes. They are largely of limestone origin, especially those of the eastern part which are the most fertile of any in the state. In the higher part of the northeast are some clay soils. In the extreme northeast are some poorer sandy soils. Toward the Ohio River are clay and sand loams, with considerable humus and disintegrated limestone.

Climate. The temperature is quite variable, but the climate generally is pleasant and healthful. The highest recorded temperature is 107 degrees, and the lowest, 35 degrees below zero, though these figures are extreme and may not be again approached for many years. The average annual temperature of the mountain regions is about 50 degrees, the rest of the state ranging a few degrees higher. The frost-free season is about 165 days, varying according to location. The snowfall is light and of short duration along the Ohio River, somewhat heavier in the center of the State, and often quite heavy in the mountains. The average annual rainfall is about 44 inches, being higher in the mountain regions. The greatest precipitation is usually in March and June, the driest months being from September to November. Destructive storms are rare.

Opportunities. West Virginia offers excellent opportunities for endeavor and investment along many lines. It has vast waterpower little utilized. Bluegrass pastures, excellent transportation facilities and good markets encourage the production of livestock. Thousands of acres of land in the river valleys are suitable for truck and other crops.

The eastern panhandle is particularly adapted to the production of apples and peaches. The Department of Agriculture, Charleston, publishes annually a list of farms for sale throughout the State.

Products and industries. Leading farm activities are dairying and truck gardening around cities, the raising of livestock in the mountain regions, with fruit in some parts, especially in the eastern part, and mixed farming in the rest of the state. Leading grain crops are corn, wheat and oats. The leading fruits are apples and peaches. Early apples for the northern markets are grown in the Ohio Valley counties, and winter apples in the east. Melon growing is extensive in the southern Ohio River counties. Aside from this, vegetable growing is mostly for local markets. Potatoes and tobacco are extensively grown. Leading livestock are horses, beef and dairy cattle; sheep and swine are also important. Bluegrass thrives in most of the state, and this favors the livestock industry. Agricultural development has been very rapid during the past few years. Purebred beef and dairy cattle, horses, sheep, swine and poultry are found in practically every county. Improved breeding is practised as community projects. Dairy testing associations are doing good work. Sheep are well suited to the steep pastures. There is a great demand for sheep, and several carloads of breeders were shipped into the State during 1917. The eastern panhandle is unexcelled for good quality fruit. Farmers are practising the most scientific methods of using fertilizers resulting in increased crop yields. Lumbering is an important industry, though much of the original forest area has been cleared. The state is rich in minerals; leading ones are coal, iron, natural gas and oil. Main manufactures are lumber and timber products, steel and iron, leather, glass, flour and grist-mill products, coke, railroad cars, meat products, foundry and machine-shop products.

Transportation and markets. The state is fairly well supplied with railroads. The Ohio River furnishes excellent water transportation along the western boundary, and the mountain streams and rivers are used for rafting lumber, and for small vessels. Within the state are 600 miles of brick and concrete roads, 932 miles of macadam and asphalt, and 1,773 miles of improved earth roads, with many more miles being built each year.

History. The present state of West Virginia was a part of the original Virginia Colony and State till the Civil War. It was not settled so early as the eastern part on account of the mountain barriers. The earlier settlers came from nearby Pennsylvania, Virginia and Maryland points. The first cabin was erected in 1727 by Morgan Morgan. In 1751–2, part of the region was explored by the first Ohio Company. After the secession of Virginia from the Union, April 17, 1861, representatives from 26 of the western counties met at Wheeling, May 13, repudiated the ordinance of secession, and summoned a "Virginia State Convention," to meet at Wheeling, June 11. The second convention declared the state offices vacant, and organized a provisional government. The legislature of the new government met July 2 and elected United States senators who were seated by Congress. A third convention met November 26, which drafted a constitution which was ratified by popular vote April, 1862, and on June 20, 1863, West Virginia was formally admitted to statehood. The capital was first at Wheeling, then at Charleston, then at Wheeling, then moved back to Charleston, which has been the capital since May 1, 1885. Population of Charleston, 1915, 35,000.

Agricultural organization. College of Agriculture and Experiment Station, *Morgantown;* substations, *Wardensville* and *Huntington*. Colored Institute, *Institute*. Coöperative Demonstration Work, *Morgantown*. State Fair is held at *Wheeling*. West Virginia Collegiate Institute, located at *Institute*, maintains a department of Agricultural Extension Work and Home Economics for Colored People.

The Experiment Station Director reports that the College of Agriculture and Experiment Station have done excellent work in improving agricultural conditions. Under their direction are six farms totalling 1,630 acres and devoted respectively to horticulture, agronomy, livestock, dairy and poultry work. All farms are under the general direction of the University professors, are well equipped, and are doing excellent experimental work. The Extension Department is made up of about 25 specialists who give part or all of their time to Agricultural Extension Work. Coöperative Demonstration work in Agriculture and Home Economics is carried on in almost every county. There are county agricultural agents in about two thirds of the counties.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	1,221,119; *958,800*
White	1,156,817
Colored	64,173
Other non-white	129
(City 228,242; country, 992,877)	
Number farmers	96,685; *92,874*
(White, 95,977; non-white, 708)	
Land area, acres	15,374,080
Acres in farms	10,026,442; 10,654,513
Acres farm land improved	5,521,757; *5,498,981*
Average acres per farm	103.7 (57.1 acres improved)
Farms by size:	
50 to 99 acres	26,806
20 " 49 "	20,323
100 " 174 "	20,156
10 " 19 "	7,863
175 " 259 "	7,481
260 " 499 "	4,767
Value farm property	$314,738,540; *$203,907,349*

Per cent increase in 10 years	54.4
" value of farm property in land	65.8
" " " " " " buildings	18.2
" " " " " " stock and tools	16.0
Average value all property per farm	$3,255
Average value land per acre	$20.65; *$12.60*
Per cent of farms run by owners	78.6
" " " " " tenants	20.5
" " " " " managers	0.9

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$40,374,776	
Value all cereals	15,997,700	
Corn, acres	676,311;	*834,000*
bushels	17,119,097;	*25,020,000*
value	$20,448,000;	*42,534,000*
av. yield per acre (10 years), bushels	30.0	
Wheat, acres	209,315;	*316,000*
bushels	2,575,996;	*4,410,000*
value	$5,435,000;	*$9,570,000*
av. yield per acre (10 years), bushels	13.4	
Oats, acres	103,758;	*143,000*
bushels	1,728,806;	*3,861,000*
value	$1,164,000;	*$3,050,000*
av. yield per acre (10 years), bushels	23.2	
Buckwheat, acres	33,323;	*45,000*
bushels	533,670;	*900,000*
value	$379,000;	*$1,530,000*
av. yield per acre (10 years), bushels	21.3	
Rye, acres	15,679;	*20,000*
bushels	148,676;	*270,000*
value	$133,000;	*$456,000*
av. yield per acre (10 years), bushels	13.3	
Dry beans, acres	8,111;	*18,000*
bushels	39,794;	*144,000*
Value other grains and seeds	$93,550	
Hay and forage, value	7,492,747	
acres	708,900	
tons	639,104	
Value vegetables	$6,968,618	
Potatoes, acres	42,621; bushels,	4,077,066
	65,000; "	*7,475,000*
Sweet potatoes and yams, acres	2,079; "	215,582
	2,000; "	*280,000*
Tobacco, acres	17,928; pounds,	$14,356,400
	11,300; "	*9,040,000*
Cane, sorghum, acres	8,607; tons,	48,094
sirup made, gallons	604,201	
Value other crops	$6,482,037	
Value fruits and nuts	3,340,124	
Apples, trees	4,570,948; bushels,	4,225,163
		5,994,000
Peaches, nectarines, trees	1,424,582; "	328,901
		608,000
Pears, trees	154,908; "	29,916
		33,000
Plums, prunes, trees	234,859; "	32,948
Cherries, trees	332,429; "	79,723
Quinces, trees	50,708; "	13,163
Grapes, vines	284,074; pounds,	3,224,751
Small fruits, acres	2,913; quarts,	2,336,562
Nuts, trees	42,167; pounds,	974,312

3. Livestock, 1910 and *1917*

Farms reporting domestic animals	92,179	
Value of domestic animals	$41,318,436	
Cattle, number	620,288; value,	$15,860,764
	614,000; "	*$27,388,000*
Dairy cows, number	239,539;	
	245,000; "	*13,108,000*
Horses, number	179,991; "	18,583,381
	196,000; "	*20,972,000*
Mules, number	11,717; "	1,339,760
	12,000; "	*1,404,000*
Swine, number	328,188; "	2,087,392
	380,000; "	*3,800,000*
Sheep, number	910,360; "	3,400,901
	715,000; "	*4,719,000*
Goats, number	5,748; "	20,682
Poultry, number	3,310,155; "	1,628,700
Bees, colonies	110,673; "	388,937
Milk produced, gallons	71,230,033	
Butter produced, pounds	18,969,099	
Value dairy products	$5,000,138	
Value poultry products	5,530,233	
Value animals sold	14,159,182	
Value animals slaughtered	4,296,936	

WISCONSIN ("Badger State"), one of the North Central States, lies between 42 and 48 degrees north latitude, and 86 and 93 degrees west longitude. Lake Superior bounds it on the north, and Lake Michigan on the east. The western boundary is formed largely by the Mississippi, St. Croix and St. Louis Rivers, and part of the northern by the Menominee. The state includes the Apostle Islands in Lake Superior, and a group of islands at the entrance to Green Bay on the Lake Michigan side. Area 56,066 square miles, 810 of which are water.

Land surface. Wisconsin is in the northern part of the Great Central Plain. The surface is mostly rolling. The highest elevation is in the north, a range of low-lying hills reaching about 1,700 feet. The larger part of the state

drains into the Mississippi River, the dividing line extending from the northern boundary to the Illinois line, at an elevation of 1,200 to 1,600 feet. In the north, this separates the Wisconsin River Valley from the Mississippi; farther south it separates the same valley from the Lake Michigan drainage region. The principal river, the Wisconsin, rises in the north, flows south through the center to within 80 miles of the southern boundary, then turns west into the Mississippi. Other rivers flowing into the Mississippi are the Chippewa and Black. Green Bay on the east receives the Fox River, the outlet of Lake Winnebago, the largest lake within the state. There are numerous smaller and picturesque lakes and some swamps in the south central areas, in a number of which drainage districts have been formed.

Soils. Except in the extreme southwestern portion, the soils of the greater part of Wisconsin owe their origin to repeated glaciation. Because of the different processes by which the soils have been formed and the wide range in characteristics of the original mineral material from which they are directly or indirectly derived, there is diversity in types. A variety of fertile upland soils have thus been given a broad distribution over the state. Clay loams predominate. The soils of northern Wisconsin are nearly all highly productive. The productive soils may be divided into three general classes: clay loams, sandy loams and red clays. The clay loams occupy much the greater portion of northern Wisconsin. In the south central area are irregular tracts of sandy loams and sandy soils. Most of the soils of lower Wisconsin consist of clay loam or sandy loam. There are areas of low, wet lands rather more extensive in parts of four south central counties and one northern county than elsewhere. In average yield per acre of principal farm crops, there is little difference among counties and one is almost safe in saying that all of the soils are found in all the counties.

Climate. Variation in the surface of the state of course influences climate. Wisconsin's geographical position, the arrangement of its high land and closeness to the Great Lakes, create a temperate climate. Lakes Michigan and Superior are said to have an average depth of 800 feet, possess a surface area equal to that of the whole state, and exert a marked influence on temperatures. While the climate is continental, and like all continental climates is subject to change, nevertheless, the time for seeding oats is quite uniform throughout the state, ranging from the first to the last of April. Corn is planted from May 10 to June 1. There are distinct climatic provinces in Wisconsin and some variation in the period between killing frosts. The average annual temperature ranges from 40 to 41 degrees in the northern part and from 45 to 47 degrees in the southern. Corn is grown throughout the state, but in the north central and more northern counties, principally for silage. Small grains, potatoes, and garden vegetables mature in all parts of the state. The rainfall varies from 28 to 33 inches but is heavier in some parts than in others. The snowfall is usually abundant, especially in the northern part. Winter temperatures in northern Wisconsin are about 8 degrees lower than in the southeastern corner of the state.

Opportunities. Large areas of new land are available for settlement in the central and northern part of the state, from which most of the heavy timber has been removed, and is known as "cut-over" land. It is owned chiefly by lumber companies, railroads and colonization companies. A large part of it is already in farms. About 90,000 acres are being brought under cultivation each year in 26 northern counties. A great deal more is being brushed off and converted into pasture and hay land every year. The unimproved land can be bought at prices ranging from $15 to $30 per acre, and on long-time payments. The amount available is estimated to be from 8 million to 9 million acres. This region is especially noted for its grasses. Information may be obtained from the Division of Immigration, Department of Agriculture, Madison.

Products and Industries. Agriculture is the leading industry. The principal products are grain, livestock and dairy products, vegetables and tobacco. The leading grains are oats, corn and barley. Great quantities of potatoes are grown in the central and northwestern part. In the southwestern part, considerable tobacco is grown. Large quantities of peas and corn for canning are grown, as well as sugar-beets and truck crops. Apples and plums are grown throughout the state for home use, and commercially near the Great Lakes and in the western portion. Small fruits also do well, and cranberries are grown in the south central area. Dairying is the most important part of the livestock industry. Horses, cattle, swine and sheep are the leading livestock. Poultry exceed sheep in value. Lumbering is now confined principally to hardwoods. Fisheries are most extensive near the Great Lakes. Leading minerals are iron ore, zinc and lead. Main manufactures are lumber and timber products; foundry and machine shop products; butter, cheese and condensed milk; leather, malt liquors; flour and grist-mill products; meat products; paper and wood pulp; furniture; boots and shoes; automobiles and agricultural implements.

Transportation and Markets. Transportation facilities are excellent both by railroad and water. The state is well covered with railroads. Railroads have good terminal facilities at points on the Great Lakes, and a large tonnage of freight is handled by vessels

plying those waters. There are 78,000 miles of public roads, and the average haul from farm to market is 5.6 miles. It would be difficult to find many points in the state more than 14 miles from some railroad.

History. Eastern Wisconsin was explored as early as 1634, and Jesuit missions were established in 1665 and 1668. The first permanent settlement was made on Green Bay in 1750. Early explorers and settlers were largely French, but joined the English in the Revolution and in the War of 1812. The United States took formal possession in 1816. Wisconsin was successively a part of the Northwest Territory, Indiana Territory, Michigan Territory, Illinois Territory and again a part of Michigan Territory. In 1836, Wisconsin Territory was organized, including also Minnesota, Iowa and about half of the Dakotas. On May 29, 1848, it became a state with its present limits. Capital, Madison; population, 1910, 25,531.

Agricultural organization. College of Agriculture and Experiment Station, *Madison;* Cranberry Experiment Station, *Grand Rapids;* the State Department of Agriculture, Live Stock Breeders' Association, State Horticultural Society and Wisconsin Experiment Association, all at *Madison.* The State Fair is held at *Milwaukee.*

Statistics

1. Farms and Farm Property, 1910 and *1900*

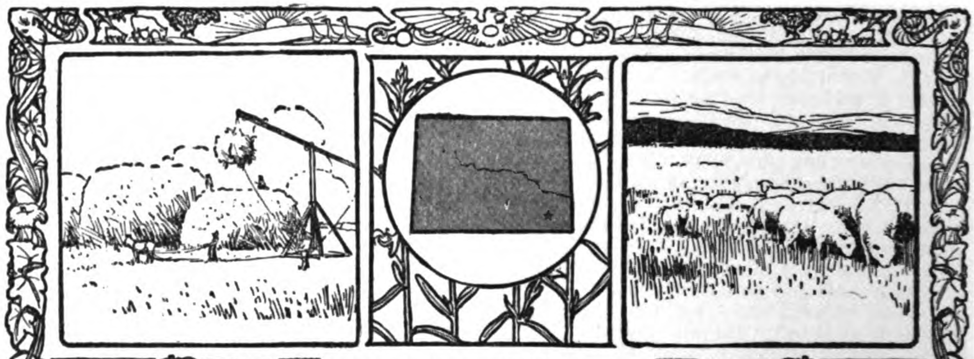
Population	2,333,860; *2,069,042*
White	2,320,555
Indian	10,142
Colored	2,900
Other non-white	263
(City, 1,004,320; country, 1,329,540)	
Number farmers	177,127; *169,795*
(White, 176,536; non-white, 591)	
Land area, acres	35,363,840
Acres in farms	21,060,066; *19,862,727*
Acres farm land improved	11,907,606; *11,246,972*
Average acres per farm	119 (67 acres improved)
Farms by size:	
100 to 174 acres	58,439
50 " 99 "	54,007
20 " 49 "	23,460
175 " 259 "	20,196
260 " 499 "	9,271
3 " 9 "	5,491
Value farm property	$1,413,118,785; *$811,712,319*
Per cent increase in 10 years	74.1
" value farm property in land	64.5
" " " " " buildings	20.5
" " " " " stock and tools	14.9
Average value all property per farm	$7,978
Average value land per acre	$43.30; *$26.71*
Per cent of farms run by owners	85.3
" " " " " tenants	13.9
" " " " " managers	0.8

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops			$148,359,216
Value all cereals			73,141,919
Oats, acres	2,164,570;		*2,250,000*
bushels	71,349,038;		*99,000,000*
value	$31,122,000;		*$65,340,000*
av. yield per acre (10 years), bushels			33.2
Corn, acres	1,457,652;		*1,918,000*
bushels	49,163,034;		*42,196,000*
value	$30,353,000;		*$68,799,000*
av. yield per acre (10 years), bushels			34.3
Barley, acres	816,449;		*600,000*
bushels	22,156,041;		*19,200,000*
value	$13,579,000;		*$23,808,000*
av. yield per acre (10 years), bushels			28.0
Rye, acres	339,213;		*410,000*
bushels	4,797,775;		*7,585,000*
value	$3,214,000;		*$12,819,000*
av. yield per acre (10 years), bushels			17.3
Wheat, acres	140,369;		*239,000*
bushels	2,641,476;		*5,327,000*
value	$3,345,000;		*$10,761,000*
av. yield per acre (10 years), bushels			19.6
Buckwheat, acres	26,298;		*23,000*
bushels	302,829;		*281,000*
value	$172,000;		*$489,000*
av. yield per acre (10 years), bushels			15.3
Emmer and spelt, acres	6,090;	bushels,	166,301
Dry peas, acres	78,017;	"	1,165,055
	53,408;	"	*782,998*
Dry beans, acres	14,574;	"	154,570
	35,000;	"	*262,000*
Flaxseed, acres	9,423;	"	118,793
Value other grains and seeds			$3,620,773
Hay and forage, value			40,866,396
acres			3,079,102
tons			5,002,644
Value vegetables			12,511,816
Potatoes, acres	290,185;	bushels,	31,968,195
	307,000;	"	*34,998,000*
Tobacco, acres	40,458;	pounds,	46,909,182
Sugar beets, acres	12,379;	tons,	127,526
	18,400;	"	*165,600*
Value fruits and nuts			$2,896,372
Apples, trees	2,430,232;	bushels,	2,232,112
			3,029,000
Pears, trees	29,841;	"	12,992
Plums and prunes, trees	105,909;	"	15,907
Cherries, trees	290,495;	"	81,340
Grapes, vines	148,348;	pounds,	701,329
Small fruits, acres	6,305;	quarts,	9,782,779
Nuts, trees	40,789;	pounds,	609,428
Value other crops			$15,321,940
Maple trees tapped			449,727
" sugar made, pounds			27,199
" trees, sirup made, gallons			124,117

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			171,023
Value of domestic animals			$153,700,250
Cattle, number	2,680,074;	value,	$67,475,224
	3,090,000;	"	*153,682,000*
Dairy cows, number	1,473,505		
	1,750,000;	"	*113,750,000*
Horses, number	614,654;	"	68,585,505
	715,000;	"	*85,800,000*
Mules, number	2,872;	"	316,066
	3,000;	"	*351,000*
Swine, number	1,809,331;	"	13,620,741
	2,060,000;	"	*29,458,000*
Sheep, number	929,783;	"	3,669,652
	645,000;	"	*4,838,000*
Poultry, number	9,433,110;	"	4,468,703
Bees, colonies	95,638;	"	360,530
Milk produced, gallons			458,327,649
Butter produced, pounds			27,200,509
Value dairy products			$53,868,028
Value poultry products			13,383,924
Value animals sold			42,241,870
Value animals slaughtered			7,562,766



WYOMING

WYOMING ("Equality State"), one of the Western States, lies between 41 and 45 degrees north latitude, and 104 and 112 degrees west longitude. Area, 97,914 square miles, 320 of which are water.

Land surface. Wyoming is a mountain state, lying in the Rocky Mountain region. It is one vast plateau with a general elevation of 4,000 to 7,000 feet, with numerous irregular mountain ranges rising to elevations of 9,000 to 11,000 feet. These are included in the Continental Divide which crosses the state from the northwest corner to the middle of the southern boundary. These mountain ranges break up the state into a number of irregular plains. The famed Yellowstone National Park is in the northwest corner. The highest point in the state is Fremont Peak, 13,790 feet, and several others exceed 13,000 feet. The principal rivers are the Platte, draining the southeastern part, the waters reaching the Missouri and Mississippi Rivers and the Gulf of Mexico; the Green in the southwest flowing into the Colorado and the Gulf of California; the Snake in the northwest, which is tributary to the Columbia, reaching the Pacific Ocean; the Yellowstone and Cheyenne in the north and northeast, with numerous tributaries all of which reach the Missouri.

Soils. These change rapidly from the mountains to the plains. Near the mountains, in many areas, are gravelly soils, shading off to light, sandy ones; in other sections, heavy clay or gumbo soils are encountered. In the southwest is an arid, alkali region known as the Red Desert, suitable, for the most part, only for grazing. Along the water courses there is more humus usually, and irrigation brings good returns, even on the mesas. The mesa soils are mostly sandy or gravelly loams. Along the eastern edge of the Rockies, the soils are usually light loam, and respond well to dry-farming.

Climate. This is generally healthful on account of the dryness of the atmosphere, though subject to great extremes of temperature between day and night. The highest recorded temperature is 110 degrees, the lowest, 51 degrees below zero. The average annual temperature of the state is about 44 degrees, though different stations show average temperatures ranging from 32 degrees to 50.9 degrees. The rainfall is light, but varies widely in different sections, ranging from 5 inches or less in the Red Desert to 12 to 20 inches in the northeast, with still higher rainfall in the mountains. The snowfall is usually not heavy except in the mountains, and the heavy snowfalls there furnish abundance of water for irrigation. The climate is such that the native grasses cure on the range and can be grazed generally during the winter. The southwestern part is not subject to severe storms, but the region east of the mountains is in the storm track from the northwest, and is subject to cold waves and severe storms, though these are usually of short duration. In some sections, frosts are liable to occur during any month, but in others a frost-free season of 120 days is expected.

Opportunities. Considerable public land suitable for agriculture is still open to homestead entry. Land offices are located at Buffalo, Lander, Douglas and Cheyenne. There are a number of large irrigation projects both private and under the Federal Government, which together have hundreds of thousands of acres not yet taken. Some of these are open either for sale or rent, or the land may be leased for small payments with the privilege of buying. Irrigation ditches extend to the various sections. Information about irrigated lands may be obtained from the Reclamation Service, Department of the Interior, Washington, D. C.

Products and industries. Probably Wyoming is the least developed agriculturally of any state. Irrigation is necessary for the pro-

duction of most crops, and grazing has been the chief agricultural industry. The leading grain is oats, which exceeds in value any other cereal. Wheat ranks next. Hay and forage exceed in value any of the grains. Vegetables and fruits are little grown except for home use or local markets. Livestock is the great source of income for the rancher. Sheep are far in the lead of all other animals in number and value. Cattle and horses come next. Leading minerals are coal, oil and copper. Manufacturing has been little developed, main lines being lumber and timber products, and flour and grist-mill products.

Transportation and markets. Railway communication is confined mostly to the transcontinental lines. River transportation is unimportant.

History. Fur traders visited this region before the middle of the eighteenth century, but it was not till 1824 that the region of the Green and Sweetwater Rivers was explored by William Ashley, of the North American Fur Company, with a band of 300 men. John Colter, the first American visitor, spent the winter of 1806–7 on Pryor's Peak, and discovered Shoshone Lake and the Yellowstone country. Captain Bonneville and General Fremont, in 1832 and 1842 respectively, were the first explorers whose discoveries were recorded at length. The first white settlement was at the present site of Fort Laramie in 1834. There had been no permanent settlement and little development prior to 1867, but the discovery of coal and gold and the completion of the Union Pacific Railroad, encouraged immigration. The Territory of Wyoming was organized July 25, 1868, from portions of Utah, Dakota and Idaho territories, and it became a state July 10, 1890. The early history of the territory was marked by serious and prolonged troubles with the Indians. The Yellowstone Park was set aside by Congress in 1872 as a public reservation. The state constitution, adopted in 1869, contained a clause permitting woman suffrage which was a continuation of a territorial law.

Agricultural organization. College of Agriculture and Experiment Station (parts of the State University); and Coöperative Demonstration Work, *Laramie*. Commissioner of Public Lands, and Wyoming Farm Board, which has charge of a series of farms over the state, *Cheyenne*. The State Fair is held annually at *Douglas*. Information relative to agriculture and stock raising may be obtained from the Director of the Agricultural Experiment Station, *Laramie*.

The Director of the Experiment Station reports that a very rapid increase in agriculture has been made in the last 10 years. Sheep raising has increased rapidly, while cattle raising has decreased slightly, due to the public lands being cut up by the entry of homesteaders. Sugar-beet factories have been located at Sheridan and Lovell, and other factories have been projected, but for the most part, the agriculture of the state has been mainly along the lines of alfalfa and grain growing. It is the first aim of the settlers to grow cash crops, and such extensive agriculture as beet growing is not usually satisfactory until after the land has been worked for several years for other crops. New settlers always aim to get their land into alfalfa, provided it is under irrigation, as quickly as possible, for the lands of the arid region are usually lacking in humus and nitrogen, while other plant foods are present in abundance. The alfalfa roots and the green plants, when plowed under, make up this deficiency, and prepare the land for other crops.

Statistics

1. Farms and Farm Property, 1910 and *1900*

Population	145,965;	*92,531*
White	140,318	
Colored	2,235	
Indian	1,486	
Japanese	1,596	
Other non-white	330	
(City, 43,221; country, 102,744)		
Number farmers	10,987;	*6,095*
(White, 10,922; non-white, 65)		
Land area, acres	62,460,160	
Acres in farms	8,543,010;	*8,124,536*
Acres farm land improved	1,256,160;	*792,332*
Average acres per farm	777.6 (114.3 acres improved)	
Farms by size:		
100 to 174 acres	3,816	
260 " 499 "	2,846	
1,000 acres and over	1,155	
500 to 999 acres	984	
175 " 259 "	783	
50 " 99 "	645	
Value farm property	$167,189,081;	*$67,477,407*
Per cent increase in 10 years	147.8	
" value farm property in land	53.2	
" " " " " buildings	5.4	
" " " " " stock and tools	41.4	
Average value all property per farm	$15,217	
Average value land per acre	$10.41:	*$2.88*
Per cent of farms run by owners	89.0	
" " " " " tenants	8.2	
" " " " " managers	2.8	

2. Crop Acreages, Yields, Values, 1910 and *1917*

Value all crops	$10,022,961	
Value all cereals	2,744,502	
Oats, acres	124,035;	*263,000*
bushels	3,361,425,	*2 468,000*
value	$1,750,000;	*$7 674,000*
av. yield per acre (10 years), bushels	36.7	
Wheat, acres	41,968;	*198,000*
bushels	738,698;	*4,206,000*
value	$804,000;	*8,412,000*
av. yield per acre (10 years), bushels	25.8	
Corn, acres	9,268;	*33,000*
bushels	176,354;	*660,000*
value	$109,000;	*$1,155,000*
av. yield per acre (10 years) bushels	23.0	
Barley, acres	8,561;	*27,000*
bushels	189,057;	*783,000*
value	$92,000;	*$1,018,000*
av. yield per acre (10 years), bushels	32.8	
Emmer and spelt, acres	1,521; bushels, 35,677	
Flaxseed, acres	1,110;	*3,000*
bushels	5,983;	*20,000*
value		*$52,000*
av. yield per acre (10 years), bushels	9.8	

Value other grains and seeds			$107,843
Hay and forage, value			6,077,354
acres			585,386
tons			853,515
Value vegetables			856,639
Potatoes, acres	8,333;	bushels,	932,162
	30,000;	"	*4,650,000*
Sugar beets, acres	1,207;	tons,	13,418
Dry peas, acres	326;	bushels,	9,231
Dry beans, acres	273;	"	1,876
Value other crops			$182,833
Value fruits			53,790
Apples, trees	27,773;	bushels,	17,836
Peaches, nectarines, trees	46;	"	5
Pears, trees	178;	"	16
Plums, prunes, trees	4,564;	"	659
Cherries, trees	919;	"	68
Grapes, vines	74;	pounds,	159
Small fruits, acres	106;	quarts,	96,883

3. Livestock, 1910 and *1917*

Farms reporting domestic animals			10,151
Value of domestic animals			$65,384,559
Cattle, number	767,427;	value,	$22,697,387
	880,000;	"	*47,960,000*
Dairy cows, number	32,699		
	55,000;	"	*4,482,000*
Horses, number	156,062;	"	12,426,838
	191,000;	"	*15,280,000*
Mules, number	2,045;	"	248,572
	3,000;	"	*291,000*
Swine, number	33,947;	"	301,716
	69,000;	"	*773,000*
Sheep, number	5,397,161;	"	29,666,228
	4,381,000;	"	*33,296,000*

Goats, number	2,739;	value,	$16,128
Poultry, number	341,050;	"	194,078
Bees, colonies	4,596;	"	20,493
Milk produced, gallons			6,453,634
Butter produced, pounds			1,192,122
Value dairy products			$539,423
Value poultry products			576,206
Value animals sold			13,573,935
Value animals slaughtered			650,745

4. Irrigation, 1909 and *1899*

Number farms irrigated	6,297
Per cent of all farms irrigated	57.3
Acreage irrigated	1,133,302
Types of project and acreages:	
U. S. Reclamation Service	12,905
U. S. Indian Service	4,270
Carey Act Projects	86,252
Irrigation districts	11,800
Coöperative enterprises	116,317
Commercial enterprises	87,935
Individual and partnership enterprises	813,823

Per cent of crops grown under irrigation:
Corn, 12.7; oats, 61.5; wheat, 62.7; barley, 58.2; emmer and spelt, 29.1; timothy, 62.1; small fruits, 52.8; rye, 24.7; alfalfa, 95.3; alfalfa seed, 72.5; potatoes, 57.2; sugar beets, 91.1.

Yields:	Irrigated	Non-irrigated
Barley, bushels	22.6	21.3
Oats, bushels	28.5	24.9
Wheat, bushels	18.6	15.9
Alfalfa, tons	2.34	2.22
Potatoes, bushels	130.2	87.4

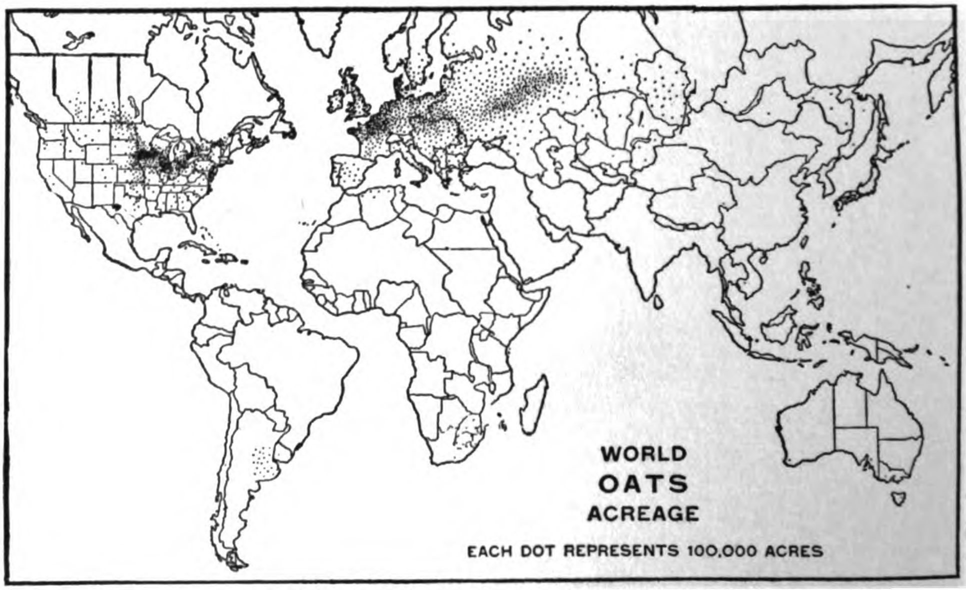


FIG. 378. Oats are clearly a crop for temperate to cool climates. In Europe they represent an important source of human food; in America their greatest use is as feed for livestock, particularly horses. (1916 Yearbook, U. S. Department of Agriculture.)

INDEX OF SUBJECTS

INDEX TO TEXT ILLUSTRATIONS

THE COUNTRY LIFE PRESS
GARDEN CITY, N. Y.